

PLAN SUMMARY REPORT
for the
MIDDLE COLORADO BASIN
WATER QUALITY MANAGEMENT PLAN



Prepared by
CONCHO VALLEY COUNCIL OF GOVERNMENTS
for
TEXAS DEPARTMENT OF WATER RESOURCES

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EXCERPT FROM
FISCAL YEAR 1980 REVISIONS
TO THE
STATE OF TEXAS WATER QUALITY MANAGEMENT PLANS
MIDDLE COLORADO BASIN

Developed in accordance with Section 208
of the Federal Clean Water Act of 1977 and
Title 40 Code of Federal Regulations
Part 35, Subpart G

Compiled by
TEXAS DEPARTMENT OF WATER RESOURCES
July 1980

FISCAL YEAR 1980 REVISIONS
TO THE
STATE OF TEXAS WATER QUALITY MANAGEMENT PLANS

INTRODUCTION

Initial water quality management plans were developed in accordance with the requirements of Section 208 of the Federal Clean Water Act, Public Law 95-217, during the period of 1975-1979. Upon completion of significant plan documents, certification was made by the Governor of Texas that the completed document was prepared in accordance with the Act and applicable federal regulations and that the plan document was adopted as the State Water Quality Management Plan for the affected area. Subsequent to that initial certification, more accurate information has been developed regarding municipal facility needs, facility design information, and facility population projections.

The primary sources of the more recent data are the revised statewide population projections (by county and designated area) contained in the document "POPULATION PROJECTIONS FOR TEXAS" (certified by the Governor) and facility-specific information developed as part of the application and/or facility planning phases of the Section 201 (PL 95-217) Construction Grants Program. The information developed within the Section 201 program has been evaluated by the Texas Department of Water Resources in cooperation with the local 208 planning agency for the affected area and the results of those evaluations are summarized in this document.

The information presented in this document is intended only to revise the facility planning information for the areas listed in the following tables. Other areas for which information is presented in the initial water quality management plans are not affected by this document.

FACILITY INFORMATION

The following tables are organized by 208 planning areas, both state and designated. Within each table, facility planning information is provided in five categories:

1. AREA - City or special district for which proposed needs are identified. The physical planning boundaries for the area are established in the management agency designation for that area certified by the Governor.
2. MANAGEMENT AGENCY - The entity proposed for designation as the management agency for the collection, treatment or both for the area in accordance with Section 208(c) of the Clean Water Act. Many of the entities listed have already been designated by the Governor for the purposes shown.
3. POPULATION - Base and projected population for the area. The population projections presented herein are consistent with the statewide population projections in "POPULATION PROJECTIONS FOR TEXAS"

and the requirements of paragraph 8a of Appendix A to Title 40 Code of Federal Regulations Part 35, Subpart E (Construction Grants).

4. TREATMENT/COLLECTION NEEDS - The columns shown under the TREATMENT NEEDS heading indicate a probable need for new facilities (N), expanded facilities (E) in terms of treatment capacity (volume), and/or upgraded facilities (U), which may be required due to more stringent effluent limits or needed plant rehabilitation. The columns under the COLLECTION NEEDS heading indicate a probable need for a new collection system (N), expansion of an existing system (E), and/or rehabilitation (R) of an existing system.
5. COMMENTS - Any special conditions relative to an area's needs are indicated in this column.

UTILIZATION OF FACILITY INFORMATION

The facility information in this document is intended to be utilized in the preparation of facilities plans and the subsequent design and construction of needed facilities, primarily in the Section 201 Construction Grants Program. Design capacities of units of the treatment and collection systems shall be based upon the population projections contained in this document plus any additional needed capacity established for commercial/industrial influents and documented infiltration/inflow volumes (treatment or rehabilitation).

The probable needs shown under the TREATMENT NEEDS and/or COLLECTION NEEDS headings are preliminary findings; specific needs for an area shall be as established in the completed and certified detailed engineering studies conducted during Step 1 (facilities planning) of the Section 201 Construction Grants Program.

EFFLUENT LIMITS

Specific effluent quality for any wastewater discharges resulting from any of the facilities recommended in this document shall be in accordance with Chapter XVIII, Effluent Standards, of the Permanent Rules of the Texas Department of Water Resources in effect at the time of permit issuance for the specific facility.

MIDDLE COLORADO BASIN

AREA	MANAGEMENT AGENCY (Collection/Treatment)	POPULATION				TREATMENT NEEDS			COLLECTION NEEDS			COMMENTS
		BASE (Year)	5 YEAR (Year)	10 YEAR (Year)	20 YEAR (Year)	N	E	U	N	E	R	
Big Lake	City of Big Lake (C/T)	2,987 (1980)	3,152 (1985)	3,400 (1990)	4,003 (2000)	X						
Sterling City	City of Sterling City (C/T)	785 (1978)	820 (1983)	808 (1988)	785 (1998)	X			X			

PLAN SUMMARY REPORT
FOR THE
MIDDLE COLORADO BASIN
WATER QUALITY MANAGEMENT PLAN

Developed to satisfy the requirements of
Section 208 of the Federal Water Pollution
Control Act Amendments of 1972.

Pursuant to
Title 40 CFR 130 and 131 and
The State of Texas Continuing Planning Process

Prepared by
CONCHO VALLEY COUNCIL OF GOVERNMENTS
for
TEXAS DEPARTMENT OF WATER RESOURCES
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PREFACE

In order to estimate costs and other characteristics of sewage collection and treatment systems, it is necessary to make estimates of future service areas, treatment plant locations, lift station locations, and trunk line layouts. These locations and configurations are estimated for preliminary planning purposes and should be considered as approximate rather than specific. Accordingly, the locations and configurations presented within this report are not specific requirements of the plan. The exact location and sizing of sewer collection/treatment system elements will be determined for a given service area when a detailed engineering study is done either as part of the 201 Facility Plan or as part of a preliminary engineering study undertaken independently of the grant program. Appropriate changes in the recommendations of this report will be made at this time, as necessary, to reflect actual conditions for the area.

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CHAPTER A
INTRODUCTION

Section 208 of the Clean Water Act of 1977 (Public Law 95-217) requires areawide wastewater treatment management planning be performed throughout the nation. The planning described in this Section of the Act consists of two types:

1. In areas with complex water quality problems, the Governor designates (a) the boundaries of each such area, and (b) a local planning agency which is responsible for preparing a wastewater treatment management plan for that area.
2. The State is responsible for preparing a water quality management plan for the remainder of the State not designated by the Governor.

The policies and procedures established by the Environmental Protection Agency (EPA), for the accomplishment of Section 208 planning by both the State and designated areawide planning agencies, are set forth in Title 40, Code of Federal Regulations, Parts 130 and 131.

Within Texas, eight areas have been designated by the Governor as being complex water quality problem areas: Killeen-Temple, Southeast Texas, Corpus Christi, Dallas-Fort Worth, Houston, Lower Rio Grande Valley, San Antonio, and Texarkana. In order to prepare a water quality management plan for the remainder of the State, the State has been divided into fifteen planning areas. The boundaries of these fifteen areas essentially follow the hydrologic boundaries of the major river basins.

The water quality management plan being prepared for each of these State planning areas consists of two primary documents:

1. Volume I. Basic Data Report includes information on existing wastewater treatment facilities; existing water quality; existing land-use patterns; existing population; and projections of economic growth, population, and probable land-use patterns.
2. Volume II. Plan Summary Report presents the recommended plan for water quality management and the legal, financial, and institutional

requirements of that plan. It also includes a description of feasible alternatives, an environmental assessment, and a summary of public participation activities conducted in the development of the plan.

The following document is the final report (Volume II. Plan Summary Report) for the middle portion of the Colorado Basin (the Concho River drainage area). It was developed through the efforts of the Concho Valley Council of Governments for the Texas Department of Water Resources, in conformance with the State of Texas Continuing Planning Process, as amended April 1976, and the appropriate federal regulations. All plan content elements as specified in Title 30, Code of Federal Regulations, Part 131 are set forth in either Volume I. Basic Data Report or Volume II. Plan Summary Report.

CHAPTER B

PROBLEM DEFINITION

Volume I identifies two categories of problems which are to be addressed in Volume II. The first category includes water quality problems which can be identified from an analysis of in-stream water quality data. The second category of problems includes those which are due to needs for various types of wastewater system facilities in a given community. The following problem definition chapter summarizes the specific in-stream water quality problems and facility needs which are addressed in this volume.

1. WATER QUALITY PROBLEM AREAS

The purpose of Chapter F, "Water Quality Assessment," in Volume I was to analyze existing data and make comparisons of existing water quality levels to the water quality standards in order to identify water quality problem areas. The majority of the data used to define water quality problems came from the following two sources:

1. Texas Department of Water Resources (TDWR) Surface Water Monitoring Network
2. United States Geological Survey (USGS) Cooperative Program

The water quality problem areas are generally defined as segments within each basin that have shown violations of the Texas Water Quality Standards as established by the TDWR.

Following is a summary of the problems identified in Chapter F and other in-stream water quality problems which have been identified subsequent to the preparation of Volume I. These additional problem areas have been identified as a result of public hearings, advisory committee meetings, and the review of Volume I by interested parties.

Dissolved oxygen deficits are the most common water quality problem in the Colorado River Basin. Only one stream segment (Pecan Bayou) has exhibited extensive dissolved oxygen problems, and they have occurred throughout the period of record, water years 1972 through 1975. The following discussion will present in numerical order the water quality violations exhibited by each segment.

a. Segment 1401. The portion of the Colorado River which is tidally influenced (Segment 1401) has exhibited a single water quality violation, and this occurred in water year 1973. On December 13, 1972, monitoring station 1401.01, located at FM 521 north of Matagorda, exhibited a dissolved oxygen concentration of 4.7 mg/l. It was visually observed that the sample was collected under normal flow conditions, and the analysis of the water sample indicated that the other measured chemical parameters were within the normal range of ambient conditions.

b. Segment 1403. Lake Austin (Segment 1403) has exhibited only one water quality violation. On July 11, 1975, monitoring station 1403.03, located near the lake's headwaters at Lakeland Park, exhibited a dissolved oxygen concentration of 3.6 mg/l. Other dissolved oxygen measurements recorded that year ranged from 5.5 mg/l to 8.6 mg/l.

c. Segment 1410. Segment 1410 of the Colorado River has generally exhibited pH values ranging from 7.0 to 8.5. However, on February 14, 1974, monitoring station 1410.01, located at SH 16 north of San Saba, exhibited a noncompliant pH value of 8.8.

d. Segment 1417. For the period of record, water years 1972 through 1975, Pecan Bayou (Segment 1417) has exhibited extensive dissolved oxygen problems. This segment has exhibited fifteen dissolved oxygen violations which have ranged from 2.8 mg/l to 4.5 mg/l. Twelve of the fifteen dissolved oxygen violations were recorded at Station 1417.01, located at FM 2126 southeast of Brownwood. The other three dissolved oxygen violations were exhibited by Station 1417.02, located at US 377 at Brownwood.

e. Segment 1501. The tidal portion of Tres Palacios Creek (Segment 1501) has only one monitoring station. In water years 1973 and 1974 this station, 1501.01, located at FM 521 east of Palacios, exhibited dissolved oxygen concentrations of 3.7 mg/l and 4.5 mg/l, respectively.

f. Segment 1502. The portion of Tres Palacios Creek above tidal influences (Segment 1502) generally has not exhibited dissolved oxygen concentrations less than 5.5 mg/l. However, in 1973 monitoring station 1502.01 exhibited noncompliant dissolved oxygen concentrations of 4.3 mg/l and 2.7 mg/l.

g. Segment 2452. Tres Palacios Bay, including Turtle Bay, exhibited no dissolved oxygen violations in water years 1972, 1974, or 1975. In 1973, each of the monitoring stations

located on this segment exhibited a dissolved oxygen violation. On December 13, 1972, monitoring station 2452.01 exhibited a dissolved oxygen measurement of 4.7 mg/l. In addition, a dissolved oxygen violation of 4.1 mg/l was recorded at monitoring station 2452.02 on September 13, 1973.

Historical water quality data available for the Middle Colorado Study Area indicate the measured water quality in the area is generally very good. No violations of established water quality standards were recorded for any of the five segments in the study area.

The only recognized potential water quality problem area within the study area is the San Angelo intensive planning area where program data (Appendix D) reveal that significant impacts on Concho River water quality are attributable to urban stormwater pollutants. Program data indicate that sanitary sewer overflows occur during significant storm events. Extremely high fecal coliform counts were recorded in areas suspected of having overflow problems. Analyses performed on bottom sediments indicate that significant oxygen demand may be exerted by the sediments if suspended. The results of this program will provide data which can be used to develop management alternatives available to the City of San Angelo to improve water quality in the Concho River. It is recommended that a study of these alternatives be initiated as a part of the continuing planning process.

2. FACILITY NEEDS

Municipal facilities were evaluated to determine cost estimates for construction of publicly owned treatment works needed to meet the 1983 goals of the Federal Water Pollution Control Act. Cost estimates from 208 planning projects, when combined with needs identified through other phases of the State's Continuing Planning Process, will serve as a basis for congressional allotment of construction grant funds in accordance with the provisions of the Act. The Statewide Needs Survey to be developed by the TDWR will utilize eight cost estimate categories as follows:

Category I	Secondary Treatment
Category II	Higher Than Secondary Treatment
Category IIIA	Collection of Infiltration/Inflow
Category IIIB	Major Rehabilitation of Sewers
Category IVA	New Collector Sewers
Category IVB	New Interceptor Sewers
Category V	Control of Combined Sewer Overflow
Category VI	Treatment and/or Control of Stormwaters

Municipal needs were identified for 208 nondesignated area projects by comparing permitted flow values to existing self-reporting flow data and predicted 1983 flows based on population and industrial growth. If the permitted flow was less than either of the two test conditions, a need was identified and then defined in terms of additional capacity to meet flows predicted for the year 2000. Other means for concluding that a need might exist were permit conditions requiring more stringent effluent quality by 1983, identification of significant septic tank problems, predicted water quality violations at presently permitted treatment levels, inspection reports by TDWR District personnel, comments from the report review process, and suspicions raised through public participation meetings. This approach inherently focused on treatment needs unless a particular collection system problem was already documented. Any identified need which was part of a 201 construction grant program did not receive further evaluation or cost estimation under this initial 208 planning effort. Being part of a 201 program was defined as having progressed in the procedures to at least being within available money on the State/EPA approved priority funding list.

The discussion of facility needs is organized by stream segment and includes a description of the need as well as the program through which corrective action will be taken.

Segment 1421

There are two jurisdictions having possible needs within this segment. However, due to the nature and timing of identifying these needs, neither municipality has been designated as a sewerage planning area as part of this plan.

The City of San Angelo operates a large collection and treatment system serving about 72,000 people. There are no major collection system needs identified at this time. Routine extension of the system will be required periodically as the City grows.

The need for major line rehabilitation, new collectors in septic tank areas, and new interceptors should be reviewed annually as part of the 208 plan update process. The City's treatment system consists of a recently expanded 8.3 million gallons per day (mgd) activated sludge plant which provides intermediate treatment prior to effluent disposal by irrigation. The operations proceed satisfactorily under a no-discharge permit. Preliminary calculations for Segment 1421 show that this no-discharge practice must continue in order to achieve water quality goals. The expanded plant, with minor modification, is reported capable of treating 11 mgd to a quality equal to effluent set 1 (20 mg/l BOD₅ and TSS). The possible treatment works need involves the provision of additional irrigation land and facilities. This matter is currently under consideration by the City. While the extent of need is being determined, a special study of low flow conditions in Segment 1421 should be conducted to establish wasteload allocations, if any, and the degree of treatment required for discharge, if practicable. It is anticipated that such a study will clearly show the irrigation approach to be the most cost-effective means for achieving water quality goals, in which case additional land and facilities will be grant eligible according to section 35.940.3a of EPA regulations and EPA PRM 75-25. The extent and timing of adding land and facilities to the City's irrigation system should be reviewed annually as part of the 208 plan update process.

The City of Miles operates a collection and treatment system with no discharge. The facilities consist of an Imhoff tank, oxidation ponds, and irrigation fields. The permit requires 20 mg/l for BOD₅ and TSS prior to irrigation. There are some unserved locations which use individual septic tanks. The possible need for facilities was recently identified during a preliminary stage of the 201 construction grant process. As a result of the late identification, planning could not be done as part of this project. However, the

specific need will be documented and alternative solutions developed during the annual 208 plan update or the 201 facility planning process, whichever occurs first.

Segment 1422

Facility needs adjacent to Lake Nasworthy resulted in the location being initially designated as a sewerage planning area. The designation was based on a septic tank problem identified through the City's bacteriological monitoring program. The fecal coliform count has gradually increased in deadend canals in one residential section adjacent to the lake. Although routine monitoring results of the central part of the lake and near the downstream release gates remain well below water quality goals, fecal counts were found to reach 1,000 to 2,000 colonies per 100 ml in the deadend canals at various times. As a result, the City completed the first phase of a construction program to provide service to four residential areas thought to be contributing to the problem. The Shady Point/Lincoln Park system is in operation under a no-discharge permit. The facilities consist of a low pressure grinder pump conveyance system, activated-sludge package plant, and irrigation fields. The new facilities satisfy the immediate need to control fecal coliform counts in certain deadend canals. The remaining eleven areas around the lake are too isolated to cost-effectively provide central systems at this time. Therefore, identification of Lake Nasworthy as a sewerage planning area is no longer necessary. However, as permanent dwellings are constructed on the presently platted lake front lots, each area in turn should eliminate the individual septic tanks and receive centralized service. The need for such systems should be reviewed on an annual basis as part of the 208 plan update procedure. The City of San Angelo is the owner of the lakefront lots (although the property is not within city limits) and, as the designated treatment works management agency, will have authority to request federal grants and to apply for permits as the needs occur.

Segment 1423

There are no facility needs identified in the drainage area of Twin Buttes Reservoir.

Segment 1424

There are no facility needs identified in the drainage area of the South and Middle Concho rivers above Twin Buttes Reservoir.

Segment 1425

One facility need has been identified within the drainage area of the North Concho River and O.C. Fisher Reservoir.

The City of Sterling City currently utilizes the septic tanks for sewage disposal. However, the City is in Step 1 of its 201 construction grant program to construct a collection and treatment system. Thus, no further planning is provided as part of this study.

CHAPTER C

SUMMARY OF PLAN

The 208 planning process for the Middle Colorado Basin consists of a series of steps which enable evaluation and selection of alternative abatement measures and the means to implement the measures. These planning steps include identifying problems, constraints, and priorities in meeting the 1983 goals of the Act, identifying possible solutions to problems, developing alternative plans to meet statutory requirements, analyzing alternative plans, and selecting an areawide plan.

This chapter summarizes the management and technical findings and recommendations developed from this planning process. Presented below are the 1983, 1990, and 2000 areawide management plans for the Middle Colorado Basin, wasteload allocation for the water quality segments, the schedule to implement the plan, the institutional, legal, and financial requirements of the plan, stream standards, and plan update information requirements.

1. WASTELOAD ALLOCATIONS FOR WATER QUALITY SEGMENTS

The classification of stream segments as either Water Quality or Effluent Limiting is based upon 40 CFR Part 130.20. It states that a Water Quality Segment is one where the current water quality does not meet applicable water quality standards and/or is not expected to meet applicable water quality standards even after the application of the minimum effluent limitations required for municipal waste treatment systems and industrial waste systems. On the other hand, Effluent Limiting Segments are those where current water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable water quality standards after the application of the minimum effluent limitations for municipalities and industries.

None of the segments in the Middle Colorado Basin Nondesignated Planning Area are currently classified as "Water Quality". As a result, no wasteload allocations were made for these segments.

2. 1983 PLAN

The development of the areawide water quality management plan for the Middle Colorado Basin involves a systematic evaluation of alternative means to achieve the 1983 water quality goals as prescribed in the Federal Water Pollution Control Act Amendments of 1972. The planning process has integrated both technical needs for pollution abatement and management arrangements capable of implementing measures. The framework under which technical planning is carried out consists primarily of the point source subplan and nonpoint source subplan elements of the areawide plan. Management planning is conducted concurrently with the technical planning and involves selecting management agencies and developing appropriate institutional arrangements through which the plan can be implemented.

The federal requirements contained in Section 208 of P.L. 92-500 are the basis for this water quality management plan. Ten particular powers and functions derived from the listing contained in the Act are necessary in order to have an effective and approvable 208 plan. These ten powers and functions include planning, operating and maintenance of facilities, design and construction of facilities, finance, permitting and regulation of point sources, permitting and regulation of nonpoint sources, standard setting, enforcement, monitoring, and management and coordination. Because of the natural interaction among these functions, they can generally be grouped into three major categories consisting of (a) general management and regulatory, (b) treatment works management, and (c) nonpoint source control. Presented below are the management and technical requirements and features of the 1983 plan by these three major categories.

a. General Management and Regulatory

Findings.

- (1) The functions and powers assigned to this group are planning, standard setting, permitting and regulation of point sources, monitoring, enforcement, and management and coordination.
- (2) The TDWR is the only agency that meets all criteria and is presently performing these functions with participation of the EPA and regional and local governments. Existing statutes and policy have assigned most of these functions to the TDWR.
- (3) The TDWR presently has the responsibility for 208 planning in nondesignated areas. Certain tasks under 208 planning have been performed under contractual arrangements

by the Concho Valley Council of Governments (CVCOG) for the TDWR in the Middle Colorado Basin.

Recommendations.

(1) Statewide water quality and wastewater planning shall remain a function assigned to the TDWR. Certain planning tasks for the Middle Colorado Basin can be delegated to an appropriate agency by contractual arrangements. Detailed planning for wastewater treatment facilities shall remain with those local entities responsible for treatment. However, the TDWR shall have prime responsibility for addressing wastewater treatment technology, including engineering and economic considerations, as it pertains to no-discharge versus discharge practices in water-short areas.

(2) Standard setting regarding water and wastewater shall remain federal and state responsibilities. The standard setting function of the TDWR is generally patterned after and has the approval of the EPA, which retains ultimate authority for program operation through periodic review and certification.

(3) Permitting and regulation of point sources shall be the responsibility of the TDWR in concert with EPA rules and regulations. The State shall continue to issue discharge permits in the Middle Colorado Basin Planning Area, based on review and evaluations of existing stream quality and the waste allocations necessary to meet stream standards.

(4) Primary monitoring of stream quality, monitoring of effluent quality, and the identification of permit violations shall be a State responsibility. Routine effluent monitoring shall be carried out by the permit holder as part of a statewide self-reporting system. Although the prime responsibility for monitoring rests with the TDWR, there are many other entities involved in data collection, analysis, and evaluation.

(5) The TDWR shall have the prime responsibility for enforcement action under normal conditions. The EPA, however, retains ultimate authority in this area under P.L. 92-500, Title III, Standards and Enforcement.

(6) To ensure that all of the functions described in the Act are allocated and performed, selected management and coordination activities must be carried out. The TDWR shall have the prime responsibility for this function. Appropriate tasks within this general management and coordination function can be delegated by the TDWR to an appropriate agency through contractual arrangements. The Planning Advisory Committee will make important input regarding policy formulation.

b. Treatment Works Management

Findings.

(1) The functions assigned to this group include design and construction, operation and maintenance, and finance of the treatment facilities. The activities performed in this category are generally intensive and highly localized. State statutes and local governmental activities have traditionally recognized and assigned these functions and required their administration by local entities. In the Middle Colorado Basin planning area, the agencies which currently perform these functions include local governments (cities and counties) and special districts.

(2) In order to carry out the structural control measures for point source pollution abatement, the Treatment Works Management Agencies (TWMA) must be designated in the plan. P.L. 92-500 requires that such agencies must have adequate authority to perform the functions assigned to this category.

(3) None of the five segments receives any point source pollution as a result of the no-discharge approach to wastewater disposal practiced in the basin. The probable need to continue this practice on Segment 1421 has been demonstrated by preliminary calculations which show that advanced treatment prior to discharge will not be sufficient to avoid a violation of the dissolved oxygen standard at low flow.

(4) There are few significant water quality problems related to the treatment works management functions in the Middle Colorado Basin planning area. The only potential problems involve the City of San Angelo and the City of Miles which may have needs within the next 5 years. Existing municipal wastewater treatment facilities are operated to produce no discharge and industrial wastewater treatment facilities are operated at no discharge or federally mandated standards. All segments in the basin are expected to meet the 1983 water quality goals under the lowflow critical conditions.

(5) There are two jurisdictions having possible needs within the study area. However, due to the nature and timing of identifying these needs, neither municipality has been designated as a sewerage planning area as part of this plan. The City of San Angelo may require additional land and equipment for part of the main plant irrigation system and additional centralized facilities in the Lake Nasworthy area. The City of Miles recently identified possible needs during the pre-application process for a 201 facility planning grant.

Recommendations.

(1) The 1983 plan recommends continuation of the treatment works management functions by local government. Upon designation as a TWMA, an entity shall be obligated to provide sufficient manpower, fiscal resources, and administrative expertise to assure that the customary tasks of facility management are properly discharged in accordance with the plan.

(2) The entities in the planning area which are recommended as designated TWMA for performing the functions assigned in this group are listed under Institutional and Legal Requirements as given in this chapter. The application of any designated TWMA to receive future federal construction grants will be coordinated by the 208 planning agency and local clearing house at the preapplication stage.

(3) Existing municipal and industrial dischargers in the Middle Colorado Basin nondesignated area shall ensure proper operation and maintenance of their wastewater treatment facilities to conform with the permit requirements. Existing practices for disposition of residual wastes shall continue.

(4) A special study of low flow conditions in Segment 1421 should be conducted to establish wasteload allocations and the degree of treatment required for discharge.

(5) The extent and timing of adding land and facilities to the main plant irrigation system of San Angelo should be reviewed annually as part of the 208 plan update process.

(6) The extent and timing of adding one or more interim centralized systems in the Lake Nasworthy area should be reviewed annually as part of the update process.

(7) The specific needs of the City of Miles should be documented and alternative solutions developed during the 201 facility planning process or the annual 208 plan update, whichever occurs first.

c. Nonpoint Source Control

Findings.

(1) P.L. 92-500 requires that nonpoint sources of water pollution be addressed as specific water quality concerns. However, at the present time the water quality effects of nonpoint sources are not well documented nor is the effectiveness of the control strategies proven.

(2) Although the State has authority to regulate the non-point sources activities, it has been the State's preference for the local government to carry out the nonpoint source control program except for agricultural and silvicultural pollution. In the case of these two sources and in accordance with DB-18A, the Texas State Soil and Water Conservation Board is designated by the Governor as the statewide management agency.

(3) The San Angelo intensive planning area was identified for special study due to suspected urban runoff pollution. Nonpoint source loadings to the Concho River (Segment 1421) are identified in Appendix D.

(4) Preliminary calculations show that urban stormwater runoff from San Angelo is likely to depress dissolved oxygen in the river below the established standard.

(5) Septic tank seepage from the Shady Point/Lincoln Park area at Lake Nasworthy (Segment 1422) has been controlled by construction of a centralized collection, treatment, and land application system. Other areas around the lake have potential for causing the same problem in the future.

(6) No significant water quality problems related to non-point sources exist or are predicted over the next 20 years for Segments 1423, 1424, and 1425.

Recommendations.

(1) The management system of the 1983 plan for nonpoint source control shall be retained by applicable local entities with the TDWR responsible for review and reporting technical study plans, problems, and progress toward solutions.

(2) Should the extent and causes of nonpoint sources of water pollution become defined before 1983, the plan shall be modified to allow the most effective governmental entity to become responsible for nonpoint source control. Local and state governments shall continue to respond to and comply with EPA regulations involving nonpoint sources such as urban runoff, major stormwater outfalls, and agricultural sources.

(3) Local and state governmental activities should encourage water quality improvement if causes and effects of non-point sources of pollution become known. These activities could include the following:

Texas Department of Water Resources

- Evaluate areas of nonpoint source concern and conduct sampling and special studies to verify problems and identify solutions.

- Develop, calibrate, and verify nonsteady state stream models.
- Provide assistance to communities and districts in developing nonpoint source control programs.
- Share technical and operational expertise and experience.

Local Governments

- Encourage improved enforcement of any existing ordinances or development of new ordinances regarding erosion control, anti-litter, leash laws, and building permits.
- Expand level of subdivision plat approval to include forms of nonpoint source control provisions.
- Perform required maintenance of sewer lines, storm sewers, drains, and drainage ditches.

(4) It is recommended that the current special study of wet-weather water quality be expanded and a stormwater simulation (nonsteady state) model be developed for every segment in the basin to better define the nonpoint source problems in the planning area. Top priority should be assigned to Segment 1421. An initial task for this special program will be to define the scope and assess the costs for continued sampling and analytical work as well as for model development. When sufficient data become available through the monitoring program, these stormwater models shall be calibrated and verified. Should the verified model indicate water quality problems in a segment, structural and non-structural control measures should then be developed. Since the TDWR is presently performing the regulatory and monitoring functions, it is recommended that the State carry out this special study program.

3. 1990 PLAN

The 1990 plan, when put into effect, will have resulted from annual updates of the 1983 plan. The 1983 plan allows for refinements and revisions to be made on an annual basis. In addition, the 1983 plan provides for flexibility and adjustments based upon technical, financial, and management needs, capabilities, and limitations. It is envisioned that the basic framework of the 1990 plan will retain many of the same characteristics of the 1983 plan. For planning purposes, the 1990 plan will be discussed in accordance with the three major groupings that exist in the 1983 plan.

a. General Management and Regulatory

Little if any change is expected to occur in this functional group in the 1990 plan. It is envisioned that the State will

upgrade stream standards and discharge permits to comply with more rigorous enforcement and regulatory activity at the federal level. This plan shall enable adjustment in treatment capacity and requirements for the local districts and treatment entities. The basic functions of permitting a point source, standard setting, monitoring, and enforcement will continue to be a primary function of the TDWR or its successor entity. For purposes of the current 1990 plan, the TDWR shall provide the management coordination function. However, it is envisioned that this management coordination function may gradually evolve towards a local management and coordinating council. This coordination function on a local basis will augment and provide input to the State management and coordination process.

In summary, the 1990 plan should be implemented using entities that exist at the time of plan formation and subsequent updates. The 1990 plan will make maximum use of the annual updates to the initial plan as it evolves.

b. Treatment Works Management

The design and construction, operation and maintenance, and finance of the wastewater treatment facilities shall continue to be retained as local responsibilities in the 1990 plan. These activities shall be in compliance and be updated to be consistent with local, state, and federal laws in force at the time of planned development. Annual revisions shall compensate for changes in laws, regulations, and technical treatment alternatives. The interface with the management and coordination agencies shall be increased and made more sensitive to the local participation and review process in its evolution from the 1983 plan to the 1990 plan.

c. Nonpoint Source Control

The 1990 plan will be adjusted to react to nonpoint source control problems identified between now and the completion of the 1983 plan. Presently, the clarity of nonpoint source problems is lacking. As the cause and effect of nonpoint source water pollution problems become identified, annual updates to this plan will reflect control strategies and requirements to effectively treat, minimize, and control their effects. The management of nonpoint source problems, however, shall be retained on a local basis primarily dealing with local laws and ordinances until such time as the scope of the cause of nonpoint source problems can be identified as being regional or statewide in nature. Should that occur, the plan for 1990 should reflect the level of government that can best accommodate resolution and control of these problems. In addition, the 1990 plan may require State control strategies and regulations to insure a full response to nonpoint source problems.

4. 2000 PLAN

The year 2000 plan, when put into effect, will have resulted from annual updates of the 1990 plan. The 1990 plan allows for refinements and revisions on an annual basis. In addition, the 1990 plan will provide for flexibility and adjustments based upon technical, financial, and management needs, capabilities, and limitations. It is envisioned that the basic framework of the 2000 plan will retain many of the same characteristics as the 1990 plan.

5. SCHEDULE OF IMPLEMENTATION

This section presents the implementation schedule of the major actions which must be taken by the designated management agencies to bring about implementation of the recommended technical and management plans. Table II-C-1 summarizes the schedule to carry out the activities recommended under each of these functional groups.

TABLE II-C-1

Implementation Schedule for Middle Colorado Basin Management Plan

<u>PROGRAM</u>	<u>PROPOSED SCHEDULE</u>	<u>PRIME RESPONSIBILITY</u>
GENERAL MANAGEMENT AND REGULATORY		
Permitting	1978-2000	TDWR
Standard Setting	1978-2000	TDWR
Monitoring	1978-2000	TDWR
Enforcement	1978-2000	TDWR
Data Base Update	1978-2000	TDWR
Public Participation Program	1978-2000	TDWR
Assistance to Local Governments	1978-2000	TDWR
Policy Decisions	1978-2000	TDWR
Coordination Assistance	1978-2000	TDWR
Fiscal Management	1978-2000	TDWR
Intensive Monitoring Survey for Segment 1421 (Low Flow)	1979-1980	TDWR
TREATMENT WORKS MANAGEMENT		
Operation and Maintenance	1978-2000	Designated Agencies
Financial Needs	1978-2000	Designated Agencies
Facility Construction Needs	1984-2000	Designated Agencies
NONPOINT SOURCE CONTROL		
Wet Weather Water Quality Monitoring		
Segment 1421	1979-1980	TDWR
All Other Segments	1980-1982	TDWR

II-C-11

TABLE II-C-1 (Cont'd)

<u>PROGRAM</u>	<u>PROPOSED SCHEDULE</u>	<u>PRIME RESPONSIBILITY</u>
Development of Wet Weather Stream Model		
Segments 1421	1979-1980	TDWR
All Other Segments	1980-1982	TDWR
Calibration and Verification of Model		
Segments 1421	1980-1981	TDWR
All Other Segments	1982-1983	TDWR

6. INSTITUTIONAL AND LEGAL REQUIREMENTS

This section identifies the distribution of responsibilities among the principal agencies involved in implementing the plan. The distribution represents the institutional arrangements necessary to meet federal, state, and local requirements regarding wastewater management. If there had been a need, this section would also have identified new legislation, ordinances, and agreements required to implement the plan. However, after review of existing law relating to wastewater management, it is clear that adequate authority is available for the various institutional arrangements to be carried out. For a detailed development of requirements, existing arrangements and alternatives refer to Appendix E, Legal Authority of Agencies in San Angelo Area.

a. Federal Requirements

The federal requirements contained in Section 208 of P.L. 92-500 are the basis for the Middle Colorado Basin management plan. These requirements state that particular powers are necessary in order to have an effective and approvable 208 plan. The list of powers and functions noted below is derived from the listing contained in the Federal Water Pollution Control Act Amendments Section 208 (b) (1)

(A) - (I) as well as Section 208 (b) (2) and 204 (b) (1)
(A) - (B). The powers and functions are as follows:

- (1) Planning
- (2) Operation and Maintenance of Facilities
- (3) Design and Construction of Facilities
- (4) Finance
- (5) Permitting and Regulation of Point Sources
- (6) Permitting and Regulation of Nonpoint Sources
- (7) Standard Setting
- (8) Enforcement
- (9) Monitoring
- (10) Management and Coordination

A series of guidance memoranda and regulations have been issued by EPA which further clarify the requirements and provide the framework for the management plan.

b. State Requirements

The Office of the Governor issued guidelines for management plan development and implementation. The guidelines of the Governor were designed to be compatible with federal requirements. The guidelines, as set forth for the most

part in Executive Order Number 18-A, are summarized as follows:

- (1) Overall responsibility for review and certification of 208 plans rests with the Governor.
- (2) The 208 planning function in nondesignated areas such as the Middle Colorado Basin is delegated to the TDWR.
- (3) Participation of locally elected officials is through appointment by the Governor to a Planning Advisory Committee for each 208 planning area.
- (4) The general management and coordination of 208 plans in nondesignated areas rests with the TDWR. Tasks within these functions consist of establishing the requirements, guidelines, and review for planning; providing liaison and coordination between the EPA and planning agencies; giving technical advice to planning agencies; insuring consistency of plans from one area to another; monitoring and reporting planning progress to the Governor; and submission of plans, designations, and other recommendations to the Governor for certification.
- (5) Existing agencies and entities shall be used to the fullest extent that is consistent with legal authority in performing 208 management functions.
- (6) Possible duplication of effort or jurisdictional conflicts must be minimized in attempting to meet requirements of 208 management functions.
- (7) A major role will be played by the State in implementation of the 208 plans.

c. Local Requirements

Federal and State requirements are reflected in the characteristics given the greatest attention at the local level. Each of the ten wastewater management functions were assessed regarding the authority, capability, accountability, and acceptability required at the local level to implement various aspects of the plan. Public participation activities and guidance by the Planning Advisory Committee provided the mechanism for screening alternatives and selecting the plan to be implemented.

d. General Management and Regulation

The implementation of the 208 plan will depend on the management agencies carrying out a number of related functions involving general management and regulatory tasks. The allocation of functions is summarized as follows:

Planning. All planning aspects regarding wastewater management within the nondesignated area must be analyzed and reviewed on an annual basis. The water quality concerns must be integrated with areawide plans. Detailed planning for wastewater treatment facilities is not included within this function, since it will remain with those local entities responsible for treatment. Statewide water quality and wastewater planning will remain a function assigned to the TDWR. Certain planning tasks can be delegated through contractual arrangements by the TDWR. The Planning Advisory Committee for the basin will remain active to assure participation by local officials.

Standard Setting. Standard setting regarding water and wastewater are and will remain federal and state responsibilities. This function of standard setting must comply with EPA requirements and their review process. EPA is responsible for administering Sections 303, 306, and 307 of P.L. 92-500 which all refer to standards. The standard setting function of the TDWR is generally patterned after and has the approval of the EPA which retains ultimate authority for program operation through periodic review and certification.

Permitting and Regulation of Point Sources. State and federal law requires each point source of wastewater to be regulated with respect to effluent quality standards and be compatible with water quality goals and the available assimilative capacity of the receiving stream. The State administers a waste control order (permit) program which parallels the federal National Pollutant Discharge Elimination System permitting process. Work is in progress to integrate the two programs into one permitting system.

Permitting and Regulation of Nonpoint Sources. Nonpoint source pollution has not been confirmed as a significant factor in the Middle Colorado Basin nondesignated area. Consequently, this function will not be specifically allocated until the nature and extent of such pollution is defined. The TDWR will coordinate the efforts to study and define the permitting and regulatory system for nonpoint source pollution.

Monitoring. Stream and effluent quality are monitored by the TDWR to determine whether standards and goals are being met. Routine effluent monitoring is carried out by the permit holder as part of a statewide self-reporting system. When violations are identified, an enforcement action could follow. The prime responsibility for monitoring rests with the TDWR, although there are many other entities involved in data collection, analysis, and evaluation.

Enforcement. When discharge standards are not met, a multiple agency involvement in an enforcement action could result. The various levels of government initiating the action could include municipalities, counties, regional authorities, the State, and the EPA. However, the TDWR is identified as having the prime responsibility for this function under normal conditions. The EPA retains ultimate authority in this area under P.L. 92-500, Title III, Standards and Enforcement.

Management and Coordination. To ensure that all of the functions described above are allocated and performed, selected management and coordination activities must be carried out. The objective is to monitor plan implementation and maintain a responsive position to a variety of inputs as the plan takes effect. The management and coordination function includes the primary responsibility for the policy decisions that impact the operation and coordination among treatment facilities, plans for new capacity, and other related water quality concerns. Prime responsibility for this function will rest with the TDWR. However, certain regional tasks within the Middle Colorado Basin can be effectively carried out under contractual arrangements by the TDWR with an appropriate regional agency. The Planning Advisory Committee will make important input regarding policy formulation.

e. Treatment Works Management

Pollution abatement and control measures involving structural solutions will depend on management agencies carrying out operational and financial responsibilities. To this end, Treatment Works Management Agencies must be designated in the plan. P.L. 92-500 requires in Section 208 (c) (2) (C) that such agencies must have adequate authority "directly or by contract, to design and construct new works, and to operate and maintain new and existing works as required by the plan" The law also requires in Section 208 (c) (2) (D) that these agencies shall have adequate authority "to accept and utilize grants, or other funds from any source for waste treatment management purposes." These

responsibilities have been discussed in this Chapter and in Appendix E. These responsibilities also must include adequate authority and effective sanctions as described in P.L. 92-500, Section 208 (c) (2) (A-I). Upon designation as a TWMA, an entity is obligated to provide sufficient manpower, fiscal resources, and administrative expertise to assure that the customary tasks of facility management are properly discharged in accordance with the plan.

The experience and capability of jurisdictions responsible for facilities management functions under the plan have been documented. Each existing entity, as well as any one which may be formed in the future, is recommended for designation as a TWMA. A list of existing jurisdictions recommended for designation is as follows:

Big Lake

Eldorado

Forsan

Mertzon

Miles

Paint Rock

San Angelo

Sterling City

Tom Green County Freshwater Supply District No. 1

Tom Green County Freshwater Supply District No. 2

Upper Colorado River Authority

7. FINANCIAL REQUIREMENTS

Water quality management activities require a range of financing capabilities as stated in P.L. 92-500, Section 208 (b) (2) (E). Adequate funding is a prerequisite to undertaking water pollution abatement actions, and therefore is a necessary element of this water quality management plan. The State (TDWR) is the planning agency designated by the Governor and is responsible for plan development and update and the funding thereof. The management agency shall be the TDWR with an emphasis toward increasing local involvement over time.

Financial requirements for water quality management involve three major sections of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Section 208 requires water quality planning, management, and coordination. Section 201 provides for grants for design and construction of publicly owned treatment works and affects the financial planning in a substantial number of communities and states. Section 204 requires the recipients of 201 construction grants to charge all users in proportion to use and to recover the proportional share of capacity cost from industrial users.

Pertinent regulations regarding financing of wastewater treatment facilities are found in 40 Code of Federal Regulations (CFR) B and 40 CFR 35. The more important federal regulations are summarized below:

- Contained in 40 CFR 35.208-2(a) (5) is the requirement that the planning agency must submit a statement that the planning process will become financially self-sustaining.
- In 40 CFR 13/.11(0) (2) the management agency must have adequate authority to:
 - accept or utilize grants from any source for waste treatment management or nonpoint source control;
 - raise revenues including the assessment of user charges;
 - incur short- and long-term indebtedness; and
 - assure that each entity or participating community pays its proportionate share of treatment costs.
- In 40 CFR 13/.11 (h) (1) municipal waste treatment system needs are required to be determined. The code requires that a program be conducted to provide necessary financial

arrangements to develop required systems. Elements of this activity include:

- definition of needs by five-year increments over at least a 20-year period; and
 - analysis of alternative waste treatment systems including total capital funding.
- ° Code 40 CFR 13/.11 (n) (1) requires the maintenance of a regulatory needs program. This activity requires the definition of regulatory approaches to water quality management, the statutory basis for the program, and the specification of relevant administrative and financial program aspects.
 - ° Contained in 40 CFR 13/.11 (1) (3) are requirements to determine needs for urban and industrial stormwater systems. Costs must be determined for needs and the impacts of nonstructural strategies (ordinances) on annual capital and operating expenses determined.

The management entities in the 1983 plan will have adequate financial capability. Each of the local entities involved in treatment will be responsible for generating revenues and budgets for expending resources to implement approved plans. The State shall establish priorities for local entities to become eligible for federal 201 construction grants.

A number of considerations are directly related to financial capabilities. Factors such as legal, institutional, and managerial capability are interrelated with the financial function.

GRANTS

Through the Section 201 Construction Grant Program, federal funds are available for the construction of publicly owned wastewater treatment facilities. The P.L. 92-500 specifies several requirements that must be met prior to receiving a 201 grant. Among the requirements are cost-effectiveness analysis, provisions for reserve capacity, establishment of a user charge and industrial cost recovery system, and the legal, institutional, managerial, and financial adequacy of the entity responsible for design, construction, operation, and maintenance of treatment works.

FINANCING AND DEBT SERVICE

Wastewater treatment systems include the collecting, transmitting, treating, and disposal of wastewater or stormwater

runoff. All treatment facilities incur costs for capital construction which requires debt service and operation maintenance and repair which requires charges to users proportional to use. In addition, the treatment system incurs administrative costs for planning, engineering, bookkeeping, accounting, and other forms of administrative control.

Capital costs for facility construction can be obtained, as applicable, from 201 federal grants, special state grants, local funds, or bond issues. Only with the federal 201 grants must the portion of capacity used by private industry be recovered. Operating and maintenance costs are covered by general revenues and service charges. The treatment entities shall comply with all local, regional, state, and federal laws regarding the receipt and use of funds.

USER CHARGE/INDUSTRIAL COST RECOVERY (UC/ICF)

To qualify for federal 201 construction grants, the publicly owned treatment facility must establish a user charge and industrial cost recovery system. Present and all future terms regarding financial arrangements shall be adhered to by the requesting local entities. For application, the local entity must:

- ° Ensure that financial and management arrangements comply with requirements;
- ° Explore alternative approaches to fulfill treatment requirements.

To ensure the financial and management arrangements comply with requirements, the TDWR shall perform the following:

- ° Assure that local entities and public officials have a timely plan for compliance with requirements;
- ° Assist in identifying and evaluating alternative means of complying;
- ° Provide for area, regional, and statewide actions necessary to achieve compliance, including the development of model ordinances.

Industrial cost recovery, as identified in Section 204, required industrial users of publicly owned treatment works to make annual payment for the portion of the cost of construction which is allocable to the treatment of their industrial wastes. Half of the funds generated through industrial cost recovery shall be retained by the local treatment entity. Of this retained amount, four-fifths

must be utilized for future plant expansion and construction and one-fifth is discretionary.

TREATMENT CONSOLIDATION

Where consolidation of treatment system occurs, equitable acquisition and/or transfer of existing facilities and debt must occur. Emphasis shall be placed on timely and accurate resolution of financial areas involving valuation of existing facilities, compensation for facilities, and disposition of outstanding debt.

The creation or consolidation into more regionally oriented treatment facilities, from a financial perspective, must be based on the federal and state requirements in effect at the time of management action.

REGULATORY PROGRAMS

An important element of water quality management is regulatory programs. These programs have a part in nonstructural strategies which minimize the likelihood or severity of water quality problems through laws, ordinances, compliance review, and penalties.

Costs of regulatory programs impact the budgets of the imposing agency, the treatment entity, and other participating agencies. Elements of cost include start-up costs, facilities costs, monitoring personnel costs, enforcement costs, and compliance agency assistance costs. Federal grants have been made available for the range of activity necessary to identify problems, define solutions, and implement control strategies. A major program for non-point source control strategies and regulatory programs is operated by the U.S. Department of Agriculture - Soil Conservation Service.

FINANCIAL ADMINISTRATION

Each local treatment entity (TWMA) shall be responsible for the maintenance of adequate financial planning and control activities. All applicable sources of financial assistance shall be sought by local entities with necessary technical, planning, and administrative assistance provided by the TDWR.

The general steps involved in financial arrangements for water quality financing in the Middle Colorado Basin non-designated area for the 1983 plan are to produce, implement, and maintain a financial, operational, and physical plan.

Annual updates to the Middle Colorado Basin plan shall be made and revisions performed for the issuance of updated 1990 and 2000 plans.

IMPLEMENTATION

Implementation activities, schedules, and resources shall be jointly prepared by the local entities and the TDWR. From a financial perspective, there are two elements in implementation:

- ° An implementation schedule that relates plan priorities to financial resources; and
- ° A program budget that commits financial resources that are necessary to effect the plan in accordance with federal, State, and local requirements.

A detailed implementation plan should be prepared to indicate expenditure and revenue characteristics for an integrated program when information is available. This implementation plan will concentrate on near-term activities with the level of detail decreasing with time. The plan will identify annual requirements over a twenty-year period.

8. REQUIREMENTS FOR INFORMATION UPDATE

The 208 Water Quality Management Plan for the Middle Colorado Basin Nondesignated Study Area has been developed from current and historical data available at the time of production. Development of the management plan was based on many elements influencing or determining the water quality in the basin. Several of these elements are expected to change, and projections of these factors to the end of the planning period have been used in compiling the Document. In order for the water quality management plan to remain relevant to the end of the planning period, the following five objectives should be accomplished: review of planning area boundaries, update of the data base, review of technical subplans, evaluate the nonpoint source management strategy, and review of stream standards and designations of segments.

Review of Planning Area Boundaries. It is recommended that consideration be given to reviewing the planning area boundaries at the beginning of each planning period. The review should incorporate the feedback from the public participation program and reflect the changes in existing and potential water quality problems.

Update of the Data Base. The elements which have been projected to the end of the planning period are population growth, industrial development, land-use changes, and water use requirements. These projections are the basis for development of the 208 Water Quality Management Plan to the year 2000, and their accuracy will determine the usefulness of the plan. Because of the importance of the data base in achieving the goals of the 208 report, the data base should be updated on an annual basis. Special emphasis should be given to the following:

Population. Since the adequacy of existing sewerage facilities, as well as identification of the need for future wastewater treatment projects, is dependent on the existing and projected distribution of an area's population, the annual update of the water quality management plan should provide for the revision of population figures in each segment and jurisdiction within the study area.

Economic Growth. Economic growth which is projected to occur primarily in Segments 1421 and 1422, which include the San Angelo metropolitan area, should be observed prior to preparation of the annual update of the water quality management plan so population and land-use variations can also be gauged.

Land Use. As with population distribution changes, land use categorization continually undergoes change, primarily in urban and built-up areas. The annual update should utilize data from cities, the Soil Conservation Service, the Texas Department of Water Resources and regional councils of governments to depict any significant land-use changes.

Review of Technical Subplans. A review of the need for technical subplans is recommended at the beginning of each planning period. This review should reflect changes in the data base and available technology for wastewater treatment, including the concern of land disposal methods versus discharge practices, and attendant engineering and economic evaluations of both. It is anticipated that plans developed from a given set of projections will change before water quality objectives for the year 2000 can be met.

Maintain Monitoring Network. In the Middle Colorado Basin Study Area, only two agencies are identified as operating monitoring stations. These agencies are the Texas Department of Water Resources and the U.S. Geological Survey.

Research indicates the U.S. Geological Survey has abandoned some monitoring stations identified in the study area and for which data were utilized in the preparation of this plan. If plans have not been made for continuation of the operations of the monitoring stations, it is recommended that the appropriate state agency consider establishment of new monitoring stations in the place of the discontinued operations or consolidation with existing stations in or near the point of monitoring. It is further recommended that, in areas identified as possible sources of pollution, monitoring stations be maintained at their present levels in order for accurate assessments of water quality trends to be identified in the annual update procedures.

Evaluation of Nonpoint Source Management Strategies. The nonpoint source assessments and water quality data currently available indicate that nonpoint source controls are not required at this time. As assessment techniques are refined, however, and more extensive water quality data become available, a need for nonpoint source management may become evident. A recommendation is made to continue to evaluate the potential for nonpoint source management strategies and to update the 208 Water Quality Management Plan to reflect any change in the loading estimates from nonpoint sources.

Water Quality Assessment. A review of the Water Quality Assessment chapter of the Basic Data Report indicates that the segments comprising the Middle Colorado Study Area are generally not in violation of standards established for each.

However, variations from standards, although infrequent and limited, are identified. It should be pointed out that Segments 1421, 1422, 1423, 1424, and 1425 are all classified as "Effluent Limiting" segments, and statewide ranking of the segments in the study area shows they are given low priority as to requiring immediate corrective steps to improve their water quality. Continued assessment of water quality parameters that should be considered in the annual update processes with appropriate monitoring as follows:

Sulphate Concentrations. Segment 1424 seldom exhibits annual mean sulphate concentrations greater than 20 mg/l. However, two of the four water samples analyzed during 1975 for sulphates exceeded the standards. This segment should continue to be monitored for detection of sulphate excesses.

Bacteria. Lake Nasworthy (Segment 1422) has exhibited annual logarithmic averages of fecal coliform greater than 10 organisms/100 ml, but less than the standard of 200 organisms/100 ml. Although historical coliform information is limited, emphasis should be placed on periodic sampling for coliform bacteria in order to establish bacteriological quality. It should be noted, that the City of San Angelo has maintained a sampling program over the past few years to determine the presence and source of coliform contamination.

Temperature. Although no stream segment in the study area has exhibited a surface water temperature value in violation of the standards, Segment 1421 (which has a temperature standard of 90° F) has exhibited two surface temperature values at Paint Rock equal to the standard. Although these measurements do not indicate a recurring problem in the segment, this parameter should be watched.

Nutrients. Although neither the TDWR nor the EPA has established criteria for nutrients, the TDWR, at the initiation of the 208 planning process, was monitoring the following nutrient parameters at all stream stations: ammonia-nitrogen, nitrate-nitrogen, and total phosphorus. Segments 1421 and 1424 should be part of a continuing monitoring program for nutrient excesses with particular attention given to ammonia-nitrogen and nitrate-nitrogen.

Metals. At the present time, no State standards exist for metals found in surface water or sediment. There is, however, a Department of Water Resources Order regulating the discharge of certain hazardous metals into or adjacent to water in the State. Federally approved criteria for metals found in water were reported available in late 1977 and should be compared to the existing metals data obtained by

the TDWR. It is recommended that findings of the data comparisons and special sampling surveys be provided for these agencies designated as preparing the annual update plans. If the presence of the metals in acceptable amount is verified, sampling surveys should be designed to determine the sources of these metals so that technical alternatives of control can be formulated. It is recommended that results of the special sampling surveys be provided to agencies recommended as preparing the annual update plans. It is also recommended that a special study address the concern of mercury content in Lake Nasworthy (Segment 1422), which has exhibited concentrations in excess of the 0.05 ug/l criterion established by the EPA for freshwater aquatic life and wildlife.

Chlorides. In Segments 1421 and 1422, particularly in the Concho River between Lake Nasworthy and Lone Wolf Dam within the San Angelo limits, concentrations of chlorides have been measured from between 50 mg/l to 250 mg/l and upwards to 400 mg/l. Although the City of San Angelo has conducted surveillance of chloride content in that segment, it is recommended that a special study concentrate on detection of the source. It is suspected there may have been improper plugging of oil wells in the vicinity of the segment, however available historic data reveals no discussion of this activity. Other studies indicate the possibility of a geological uplift east of the segment in question which may carry saltwater.

Pesticides. In the Concho River at Paint Rock, Segment 1421, concentrations of DDD and DDE have been present in the sediment almost every time a sediment sample has been collected. Also, with DDD and DDE, trace amounts of chlordane and DDT have also been found in the bottom sediment at this station. More water quality information is necessary before an accurate assessment of water quality trends can be made for the Middle Colorado River Basin, since a majority of the stream segments have been monitored only since water year 1974. Therefore, it is recommended that a program of monitoring for the aforementioned elements be either maintained at the present level or be intensified.

Review of Stream Standards and Designation of Segments. The existing water quality data and wasteload projections indicate that the overall water quality in the basin is good. No specific changes in stream standards or stream designations are recommended at this time. The stream standards and segment designations should be reviewed periodically, however, to determine whether water quality standards continue to be consistent with uses.

An update of the 208 Water Quality Management Plan may be required as information becomes available from citizen input, municipal census, or special study projects. Data from 201 facility plans, public hearings, environmental impact statements, and information on the cost of treatment should be included in the updates. Much of this data will be developed for purposes other than water quality management, and updating of the plan will require monitoring of the information developed by other public or private agencies.

In addition to the basic data, special studies are recommended to develop particular information necessary to the management plan. Of particular importance is development of a low flow steady state model for Segment 1421. Equal emphasis should be given to a nonsteady state model (wet weather) for the same segment (1421). Further, as funding permits, nonsteady state models should be developed for all segments to allow evaluation of nonpoint source pollution.

9. STREAM STANDARDS

The Texas Water Quality Standards report is the current revision of a document, Water Quality Requirements, which the TDWR staff developed in early 1967. In order to comply with the requirements of the Federal Water Pollution Control Act Amendments of 1972, the requirements were revised and approved by the EPA on October 25, 1973. The standards were amended, in part, on three occasions: in October 1974, January 1975, and October 1975. The EPA approved these revisions on February 9, 1976. A complete listing of the current standards set for the segments in the Middle Colorado Basin planning area is included in Volume I, Chapter C, of this plan.

Based on the existing water quality data, wasteload projections, and analyses performed in this study, no specific recommendations for changes in stream standards can be made at this time. However, it is recommended that an evaluation for consistency of water uses and standards in all segments be considered in the next water quality standards revisions.

CHAPTER D

SEGMENT SUMMARY

1. SEGMENT 1421

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Middle Colorado Basin, Segment 1421. Additional information is provided in Appendix E, Legal Authority of Agencies in the San Angelo Area. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 1421.

(2) Physical Boundaries. Segment 1421 contains the drainage area of Concho River from the Colorado confluence to the Fork in San Angelo, including the South Fork to the Lake Nasworthy Dam and the North Fork to O. C. Fisher Reservoir Dam.

(3) Existing Management Agencies. The primary federal and state agencies involved in overall segment management are the EPA and the TDWR. Other agencies within Segment 1421 include the Concho Valley Council of Governments, West Central Texas COG, and Upper Colorado River Authority. Each of these agencies has specific authority to perform certain management functions. Intergovernmental devices allow for contracting for wastewater management functions between or among agencies within or outside the segment boundaries.

Segment 1421 traverses a part or all of six counties: Coke, Concho, Irion, Runnels, Schleicher, and Tom Green. There are 3 cities and several special districts within the segment boundaries. Fourteen waste control orders are in existence. The municipalities within the segment are Miles, Paint Rock, and San Angelo.

(4) Water Quality Control Programs. There are three basic groups of program management functions that consist of general management and regulation, treatment works management, and nonpoint control. The functions within each group are discussed in Chapter C of this report under Institutional and Legal requirements.

The TDWR has the major role in performing general management and regulation functions with participation of the EPA, regional agencies, and local government. Miles is going to do facility planning under a 201 grant in the future. There are no 208 sewerage planning areas in the segment. The San Angelo area is designated for 208 intensive planning in regard to urban stormwater runoff. San Angelo may also become a 208 sewerage planning area in the future, if an addition of irrigation land becomes necessary for effluent disposal. General planning is conducted within the segment by the Concho Valley COG and the West Central Texas COG. Water quality is monitored through the networks of the TDWR and USGS. The cities of Miles and San Angelo manage existing treatment works. Local governments (county or city) carry out nonpoint source control programs.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 1421. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix F, Nonpoint Source Assessment Methodology.

(2) Assessment. There are seven categories of nonpoint source activities identified in Segment 1421. A discussion of each category and the related water quality problems is given below.

Agricultural

In Segment 1421, there are two counties that are ranked in the upper quarter as potential sediment yielding areas. In Table B.14 of the "Agricultural - Silvicultural" Methodology, Runnels County is ranked fourth of 49 with a sediment loading potential of 5.46 tons/day/sq. mile. In that same table, Tom Green County is ranked eleventh of 49 with a sediment loading potential of 3.32 tons/day/sq. mile. In Segment 1421, the present land usage is predominantly rangeland (60%) with nonirrigated farming second (34%), followed by urban (4%), and irrigated farming (2%). These percentages should not change appreciably through 1995.

General soils maps provided by the Soil Conservation Service were used to further delineate the soil types in Segment 1421. In Concho County, the soil erodability factor (K) averages approximately 0.30--furthermore, the hydrologic class of soil predominant in Concho County is soil group D (61%) and soil group C (36%). These soils are characterized by slow infiltration rates and moderate to high

runoff potential. They have a slow to moderate water transmissibility. In Tom Green County, the K factor averages approximately 0.25. The hydrologic soil classes found include D (50%), C (49%), and B (1%). The portion of Runnels County included in the MCSA exhibits soils with K factors which average approximately 0.32, with hydrologic soil classes C (60%), and D (40%). A small portion of Scheicher County in Segment 1421 exhibits an average K factor of 0.15 and predominant soil class D.

The types of crops grown in the portion of Tom Green County in Segment 1421 include cotton, grain, sorghum, and wheat. This is also true of the portions of Concho and Runnels counties in Segment 1421. Portions of Schleicher County included in Segment 1421 are ranching areas.

The average annual rainfall for portions of the Middle Colorado Basin as listed in Volume 2 of the Physical Resource Inventory of the Concho Valley is 20.37 inches, with the months of April, May, and September providing the highest monthly rainfall amounts. Generally, this is applicable to the Middle Colorado Basin as a whole.

Mining

There are no ongoing sand and gravel mining operations in the Middle Colorado Basin. There are several old limestone quarries in the area that have been abandoned, and are no longer of consequence as possible nonpoint sources of pollution due to replacement of top soil for revegetation. There is an active limestone quarry operation located southwest of San Angelo just north of U.S. 67, about 3 miles west of the San Angelo city limits. Reece Albert, Inc. of San Angelo operates the pit. It is on top of the hill locally known as Willeke Hill and the closest conveyance channel is locally known as Red Arroyo. There are no impoundments for several miles downstream. Because the quarry is a pit, there is no appreciable runoff to consider, and processing water is recycled due to the unavailability of an abundant supply. In summary, it is unlikely that this operation could contribute significantly to any water quality problem.

A review of the Water Quality Assessment Chapter of the Basic Data Report indicates an approximate 6:1 ratio of chloride to sulfate which does not indicate that Segment 1421 has a brine well pollution problem. The oil and gas production fields in this segment are listed in Table II-D-1.

TABLE II-D-1

Oil and Gas Production Fields in Segment 1421
Oil and Gas Division
Railroad Commission of Texas

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth (Feet)</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Cave	Concho	9-75	3,540	220
Chambers Ranch	Concho	7-64	2,572	62,355
Four Corners	Schleicher	7-72	3,832	55,109
Harriett	Tom Green	8-50	4,675	396,868
J-D	Concho	3-75	4,169	19,689
Ju-Jan-Jac	Tom Green	7-64	4,549	21,010
Mt. Susan, S.	Tom Green	12-54	5,296	1,370,144
Paint Rock, Wes	Concho	7-71	3,314	206,697
Pecan Station	Tom Green	10-53	4,500	1,102,783
Red Creek	Tom Green	5-74	4,110	1,874
Rust, South	Tom Green	1-53	4,494	214,233
Speck	Concho	8-57	3,212	217,527
Speck, North (Canyon)	Concho	5-61	3,191	253,457
Speck, North (Strawn)	Concho	3-61	3,574	1,495,767
Speck, South	Concho	8-65	2,266	1,056,990
Susan Peak	Tom Green	12-48	4,724	13,458,291
Susan Peak (Cisco)	Tom Green	8-50	4,535	1,725,396
Susan Peak, E.	Tom Green	8-63	4,816	72,469
Susan Peak, N. (Canyon)	Tom Green	4-58	4,232	801,892
Susan Peak, N. (Strawn)	Tom Green	4-53	4,700	56,523
Susan Peak, S.	Tom Green	12-49	4,933	94,233
Yan-Kee	Tom Green	11-55	3,867	1,773,194

II-D-4

Construction

In Segment 1421, there are four rural road construction projects in two counties (Tom Green - 1; Concho - 3). The closest point of any of the four to a significant water body is approximately 12 miles. In Tom Green County, the proposed project to reconstruct U.S. 87 to a four-lane divided roadway is scheduled for letting around 1988. The predominant soil type along U.S. 87 within the project limits is the "Angelo" association which is soil class "C" with an associated erodability factor (F) of 0.32. The three construction projects listed in Concho County are all between the Tom Green county line and Eden on U.S. 87. This work will eventually upgrade U.S. 87 from the existing facility to a four-lane, divided roadway to adjoin and match the work previously described in Tom Green County. The time frame for starting these projects is about 1988. The soil class along U.S. 87 is predominantly "D" with an associated erodability factor (K) of 0.32. The general land slope in the project areas is 0 to 3%. For reference, a listing of the projects is presented in Table II-D-2.

The ambient water quality in the area is within standards. Since no major relocations are planned and the proposed work is so far removed from the nearest stream segment, it appears that these construction projects will not contribute significantly to any foreseeable water quality problems.

Waste Disposal

Aside from the San Angelo Intensive Planning Area, there are five other significant population centers in Segment 1421. Miles is a small community in the southwest corner of Runnels County on U.S. 67. Paint Rock is located in northwest Concho County on U.S. 83. Veribest lies east of San Angelo in Tom Green County on F.M. 380. Also in Tom Green County, Wall lies southeast of San Angelo on U.S. 87. Mereta is located in eastern Tom Green County on F.M. 388.

San Angelo and Miles have the only sewage collection and treatment facilities in Segment 1421. San Angelo also has a landfill site. These other named areas rely on individual septic tanks and individual solid waste disposal sites. The soil strata previously described is not conducive to septic tanks because of very slow percolation rates, and, to insure safe operation, constant maintenance is required. Area water quality data indicates that there are no significant pollution problems at present from septic tanks and solid waste disposal sites. Continued close attention to correct designs for these systems is in order to insure future safe operation.

TABLE II-D-2

Major Highway Projects in Segment 1421

<u>Highway</u>	<u>County</u>	<u>Lngh</u> <u>Props.</u> <u>Work</u>	<u>Cost</u> <u>Million</u>	<u>Project Limits</u>	<u>Plan</u> <u>Schd.</u>	<u>Comments</u>
U.S. 87	Tom Green	14.0	7.3	Fr 3.7 Mi W of Wall To Concho C/L	1988	Const. 4-ln, divided highway
U.S.87	Concho	6.3	3.2	Fr 7.5 Mi W of Eden 6.3 Mi Northwest	1979	Improve alignment and grade
U.S. 87	Concho	6.0	1.5	Fr Tom Green C/L to 13.8 Mi NW of Eden	1982	Improve alignment and grade
U.S. 87	Concho	20.0	5.6	Fr Tom Green C/L To Eden	1988	Const. 4-ln, divided highway (2 contracts)

Saltwater Intrusion

The surface waters in Segment 1421 exhibit a moderate to low level of TDS concentration. The existing levels are partially attributable to soil characteristics and agricultural activities. The general soil classification and subsurface strata tend to be impermeable, and not susceptible to intrusion-type pollution. However, concentrations of chlorides have been measured from between 50 mg/l to 250 mg/l between Lake Nasworthy and Lone Wolf Dam within the San Angelo limits. It is recommended that a special study concentrate on detection of the source of chloride (salt-water) intrusion to this segment.

The only major aquifer in Segment 1421 is the Edwards-Trinity Aquifer. It is composed of the Edwards limestones and sand of the Trinity Group. Water in this aquifer is generally fresh and contains from 200 to 700 mg/l total dissolved solids; however, portions of the aquifer (particularly northern and western sections) have exhibited as high as 3500 mg/l. A minor aquifer, the Hickory Sandstone Aquifer, just touches Segment 1421 in Concho County. This aquifer traditionally exhibits less than 500 mg/l TDS.

A minimal amount of injection activity was found to occur in Segment 1421. Table II-D-3 summarizes the oil fields where secondary and enhanced recovery has been utilized.

Hydrologic Modifications

There are no large impoundments in Segment 1421. However, a small impoundment known as Bell Street Lake exists within the City of San Angelo. This lake may have contributed to several short-term events of high BOD concentrations and high fecal coliform counts. These high values have been observed to be rainfall runoff dependent. The portion of load contributed by the lake cannot be defined at this time. The storm sewer outflows after extended dry weather are probably more significant than the small lake. Detailed discussion of BOD and fecal coliform is addressed in Appendix D.

Urban Stormwater Runoff

In Segment 1421, there are three significant urbanized areas--Paint Rock, Miles, and San Angelo. Paint Rock and Miles are typical small farming communities with very little impervious area, no storm sewers, and a resultant tendency toward no significant stormwater pollution capability. The City of San Angelo, as a designated intensive planning area, contributes a significant portion of urban stormwater runoff to the segment. The loading and impact of this nonpoint source of pollution is defined as part of the intensive planning study in Appendix D. Some additional discussion is given in Appendix G, Pollutant Loading for Assessment of Impacts on Category IV Segments in the Middle Colorado Study Area.

TABLE II-D-3

Secondary and Enhanced Recovery in Segment 1421
 Oil and Gas Division
 Railroad Commission of Texas

<u>Field</u>	<u>County</u>	<u>Depth Production Zone (Ft.)</u>	<u>Average Horizontal Permeability (Millidarcy)</u>	<u>Beginning Date of Injection</u>	<u>Type of Fluid Injected</u>	<u>Type of Injection</u>
Pecan Station	Tom Green	4525	249	1-65	Saltwater	Gas Storage
Speck	Concho	2150	332	3-74	Saltwater	Pressure Maint.
Yan-Kee	Tom Green	3800	25	2-60	Saltwater	Waterflood

c. Wasteload Projection

Since Segment 1421 is classified as Category IV, both point and nonpoint discharge wasteloads should be projected.

(1) Point Source. There are three municipal and eleven industrial WCO holders located in this segment. Only one of these, West Texas Utilities, discharges to surface waters. However, there are no pollutants associated with it. The no-discharge policy for other sources is expected to be continued into the future. Therefore, the point source wasteloads on the segment are projected to be negligible over the next twenty years.

(2) Nonpoint Source. The San Angelo intensive planning area was identified for special study due to suspected urban runoff pollution. The objective of this activity was to verify the significance of nonpoint source waste loadings in the San Angelo SMSA. Water quality samples gathered and laboratory analyses revealed that significant impacts on Concho River water quality are attributable to urban stormwater pollutants. Program data indicate that sanitary sewer overflows occur during significant storm events. Extremely high fecal coliform counts were recorded in areas suspected of having overflow problems. Analyses performed on bottom sediments indicate that significant oxygen demand may be exerted by the sediments if suspended. The results of the data analysis are given in Appendix D.

Preliminary estimates of nonpoint source waste loads are given in Appendix G. The estimates show urban runoff loads will increase for the San Angelo area by the year 2000. Agricultural loads to the segment constitute the next most significant nonpoint category.

d. Wasteload Analysis

The Concho River from the Colorado River confluence to the fork in San Angelo is currently classified as "Effluent Limiting. The desirable water uses designated for this segment are contact and noncontact recreation, propagation of fish and wildlife, and domestic raw water supply. To accommodate these needs, the following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg., not more than)	200 FECAL/100 ml
Temperature	90° F
Chloride (not more than)	600 mg/l
Sulfate (not more than)	500 mg/l
Total Dissolved Solids (not more than)	2000 mg/l

Segment 1421 does not receive any point source pollution. The need to continue a no-discharge policy for the segment has been demonstrated by preliminary calculations which show that advanced treatment (set 4NA) prior to discharge will not be sufficient to avoid a violation of the dissolved oxygen standard. Preliminary calculations also show that urban stormwater runoff pollution will depress dissolved oxygen in the river below the standard. The impact of urban runoff is reported in Appendix D.

e. Sewerage Planning Area Alternative Plans

At present there are no sewerage planning areas located in this segment; thus, no alternative plans have been developed. There is potential for Miles and San Angelo being designated as sewerage planning areas in the future.

2. SEGMENT 1422

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Middle Colorado Basin Segment 1422. Additional information is provided in Appendix E, Legal Authority of Agencies in the San Angelo Area.

This section contains three major topics: description and boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 1422.

(2) Physical Boundaries. Segment 1422 contains the drainage area of Pecan Creek and Lake Nasworthy.

(3) Existing Management Agencies. The primary federal and state agencies involved in overall segment management functions are the ERA and the TDWR. Another agency within Segment 1422 having planning authority is the Concho Valley Council of Governments. Intergovernmental devices allow for contracting for wastewater management functions between or among agencies within or outside the segment boundaries.

Segment 1422 is completely within Tom Green County. The City of San Angelo lies partially within the segment boundaries. Four waste control orders are in existence.

(4) Water Quality Control Programs. There are three basic groups of program management functions which consist of general management and regulation, treatment works management, and nonpoint control. The functions within each group are discussed in Chapter C of this report under Institutional and Legal requirements. The TDWR has the major role in performing general management and regulation functions with participation of the EPA, regional agencies, and local governments. There are no 201 facility planning projects or 208 sewerage planning areas in the segment. The San Angelo 208 intensive planning area does not include any part of Segment 1422. San Angelo property around Lake Nasworthy may become a 208 sewerage planning area in the future, when addition of collection and treatment system become cost effective for effluent disposal. General planning is conducted within the segment by the Concho Valley COG. Water quality is monitored through the networks of the TDWR and USGS. The City of San Angelo manages two treatment works within the segment. Local governments (county and city) carry out nonpoint source control programs.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 1422. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix F, Nonpoint Source Assessment Methodology.

(2) Assessment. There are seven categories of nonpoint source activities identified in Segment 1422. A discussion of each category and its related water quality problems is given below.

Agricultural

With approximately 4 percent of Segment 1422 devoted to cultivation endeavors, it is not surprising that the probability of significant pollution problems due to agriculturally related nonpoint sources of pollution is low. The predominant soil classification is "D" with an erodibility factor ranging from 0.10 to 0.20. This soil type is conducive to forage growth which supports the fact that approximately 90 percent of Segment 1422 is presently devoted to ranching activities. This probably will be reduced to approximately 80 percent by 1995 if the City of San Angelo expands according to present southwesterly trends. If competent grazing practices are followed by area ranchers, the soil losses during rainfall events will be minimal.

Mining

The only significant mining activity in Segment 1422 is one oil and gas production field. This field does not appear to be contributing significantly to any water quality problems in the area, although future assessments should pay heed to chloride/sulfate ratios for indicators of future problems. The only oil and gas production field in Segment 1422 is the Atrice Field in Tom Green County. This field was discovered in January 1960, at a depth of 392 feet. It had produced a total of 31,197 barrels as of January 1976.

Construction

The only significant construction project in the segment for the next 10 years is the minor reconstruction (base and surfacing) of a portion of RM 584. The project is proposed for letting in 1979. At an estimated cost of \$323,000, the job will cover approximately 6.3 miles and extend from 9.2 miles southwest of San Angelo, southeast and east to an

intersection with U.S. 277. This project is termed a non-major action by the Environmental Impact Assessment which was written prior to final development of construction plans by the State Department of Highways and Public Transportation.

Waste Disposal

There are no significant population centers in Segment 1422, and all waste disposal systems are individual in nature--principally septic tanks and individual dump areas for solid waste. A common dumping area locally known as Red Bluff, serving Lake Nasworthy residents, has been closed to the public since late 1977. West Texas Utilities Company operates the San Angelo Power Station adjacent to Lake Nasworthy. This facility is a gas turbine generator with a secondary combined steam "backup". There are no disposal discharges other than cooling water, which is recycled and not discharged into Lake Nasworthy until temperatures are comparable to ambient lake readings. Mathis Airport has an independent sewage treatment plan which was built during World War II to serve approximately 5,000 persons. The inflow is very small compared to design capacity, and no flow ever leaves the lagoon.

A cause for concern is the presence of numerous individual septic tanks in the immediate lake area. Improper design, improper maintenance, high permeability of the lake front soils, and a pest problem all combine to lower the safety and effectiveness of individual systems. The aforementioned pest problem is the nutria population which resides in and around Lake Nasworthy. These rodent-type amphibians dig under the banks of the lake and have been known to open direct tunnels between septic tank drain lines and/or drain fields and the lake waters. This problem is realized and monitored to keep such occurrences to a minimum. Lake properties in the Shady Point/Lincoln Park area are not served by a central system consisting of a package plant and irrigation field. Other small systems will be added when it becomes cost effective to serve 4 or 5 other isolated areas around the lake. As the City grows in the southwesterly direction over the next 10 to 15 years, connection of the small systems around the lake to the City's main plant may become feasible.

Saltwater Intrusion

The surface soils and subsurface geological formations in Section 1422 are described as largely impermeable. Among other things, this indicates that groundwaters are not

susceptible to subsurface intrusion of salt waters into fresher waters. The Edwards-Trinity Aquifer extends into this segment. No other differentiated aquifers occur in this section of Tom Green County. There are no oil fields which have utilized any injection recovery processes in Segment 1422, and there are no known surface sources for salt minerals. However, concentrations of chlorides have indicated some intrusion in the area; it is recommended that a special study concentrate on detection of the source of saltwater intrusion to this segment.

Hydrologic Modifications

The only significant hydrologic modification in Segment 1422 is the combination concrete and earthen dam which forms Lake Nasworthy. The hydrologic data is as follows:

Q (M^3/sec) = 2.1; Vol. ($M^3 \times 10^6$) = 0.154; Depth (M) = Ave. 5;
Length (M) = 4,000

Using these values and the formula given on page 9 of Chapter IV of the Methodology for Hydrographic Activities, the densimetric froude number can be calculated. Then, according to the ranges given in Appendix F, a reservoir can be classified according to its stratification tendency. Statements can then be formulated on possible water quality problems within that reservoir. The froude number for Lake Nasworthy (4.5) indicates that it is a shallow, slightly eutrophic reservoir that ranks as completely mixed. Large inflows should have the inertia to disrupt the density structure. Increased turbidity and other undesirable properties of complete disruption could occur; however, with Twin Buttes Reservoir immediately upstream controlling inflows, Lake Nasworthy rarely suffers from such adverse occurrences. Existing water quality data provide a basis of confidence that this controlling effect is working.

Urban Stormwater Runoff

There are no significant urban areas in Segment 1422.

c. Wasteload Projections

Since Segment 1422 is a Category III segment, only point source discharges need to be projected at this time. There are two municipal and two industrial WCO permits located in the segment. Only one permit allows a discharge which emanates from a cooling water system having no recognized pollution load. The other three wastewater disposal systems are operated under no-discharge permits. Since a no-discharge policy is expected to continue over the next twenty years, there are no point source wasteloads projected to impact on the water quality of this segment.

d. Wasteload Analysis

Lake Nasworthy is currently classified as "Effluent Limiting". The existing uses include domestic raw water supply. The State specified uses deemed desirable are contact and noncontact recreation and propagation of fish and wildlife. The following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	93.0 F
Chloride (not more than)	450 mg/l
Sulfate (not more than)	400 mg/l
Total Dissolved Solids (not more than)	1/2,500 mg/l

Since no point source wasteloads discharge into the segment, water quality in Lake Nasworthy is only influenced by non-point source discharges. The only significant type of non-point source impacting on the segment is septic tank seepage. Mining activities may contribute more in the future and should be monitored as growth occurs. Saltwater intrusion is also suspected, as high chloride counts have been measured, and these concentrations should be monitored. A special study is also recommended to address the source of this intrusion.

An examination of data presented in Chapter F, Water Quality Assessment, of Volume 1 report indicates the water quality in Lake Nasworthy has been very good. No violations of established water quality standards have been recorded.

Since no point source wasteloads are projected to be discharged into the segment by the year 2000, and no significant increase in nonpoint source activity can be quantified, serious water quality problems are not expected in this segment through the planning period. However, septic tank controls, provision of centralized systems when cost-effective, and continuation of a no-discharge policy are prerequisite to the conclusion of no serious water quality problems.

e. Sewerage Planning Area Alternative Plans

At present there are no sewerage planning areas located in this segment; thus, no alternative plans have been developed. There is potential for San Angelo being designated as a sewerage planning area in the future as the need for centralized systems occurs around Lake Nasworthy.

3. SEGMENT 1423

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the middle Colorado Basin Segment 1423. Additional information is provided in Appendix E, Legal Authority of Agency in the San Angelo Area.

This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 1423.

(2) Physical Boundaries. Segment 1423 contains the drainage area of Spring Creek, Dove Creek, and Twin Buttes Reservoir.

(3) Existing Management Agencies. The primary federal and state agencies involved in segment management functions are the EPA and the TDWR. The Concho Valley Council of Governments has general planning and clearing house review responsibilities within the segment. County governments with certain management responsibilities are Tom Green, Irion, Schleicher, and Crockett. Intergovernmental devices allow for contracting for wastewater management functions between or among agencies within or outside the segment boundaries. The City of Mertzon and several special districts are within the segment boundaries. There is one waste control order in existence.

(4) Water Quality Control Programs. There are three basic groups of program management functions which consist of general management and regulation; treatment works management and nonpoint control. The functions within each group are discussed in Chapter C of this report under Institutional and Legal requirements. The TDWR has the major role in performing general management and regulation functions with participation of the EPA, regional agencies, and local governments. There are no 201 facility planning projects or 208 sewerage planning areas in the segment. General planning is conducted within the segment by the Concho Valley COG. Water quality is monitored through the networks of the TDWR and USGS. The City of Mertzon manages existing treatment works. Local governments (county or city) carry out non-point source control programs.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 1423. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix F, Nonpoint Source Assessment Methodology.

(2) Assessment. There are seven categories of nonpoint source activities identified in Segment 1423. A discussion of each category and its related water quality problems is given below.

Agricultural

Segment 1423 is made up from parts of four counties--Tom Green, Irion, Schleicher, and Crockett. All but Tom Green fall in the lower one-half of the land resource rankings of sediment loadings for the Colorado River Basin. Except for a small portion of Tom Green County where cotton and grain crops are farmed, the area is ranch country--grasslands abound. Land-use studies for present through 1995 give figures of approximately 7 percent for nonirrigated farming and approximately 4 percent for irrigated farming. There are no significant urban areas, and water covers another approximate 6 percent. The remaining 83 percent is devoted to ranching activities.

This predominance of ranching can be traced to the suitability of soils for the various usages. General soils maps indicate a high percentage of the soils are of the Tarrant-Ector association with some other variations of the same soil types. These soils are formed from limestone and are very shallow. At approximately 8 to 10 inches, caliche and fractured limestone occur which are unsuitable for cultivation.

Mining

There are no significant mining activities in Segment 1423 except the petroleum industry. Listed in Table II-D-4 are the oil and gas fields which are found in this area.

TABLE II-D-4

Oil and Gas Production Fields in Segment 1423
Oil and Gas Division
Railroad Commission of Texas

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels)</u>	
				<u>a/o</u>	<u>1-76</u>
Brooks (Canyon)	Irion	5-58	6,036		74,822
Brooks (Canyon K)	Irion	9-73	6,494		30,295
Brooks (Canyon L)	Irion	9-59	6,224		181,386
Brooks (San Angelo)	Irion	4-59	1,245		513,937
Brooks North	Irion	4-60	958		58,941
Brooks South	Irion	7-73	5,896		1,712
Brooks Southeast	Irion	11-59	1,118		80,694
Bubenik	Tom Green	4-64	5,415		109,388
Buttes (Strawn)	Irion	11-68	7,191		459,301
Buttes (Wichita)	Irion	2-69	4,330		81,048
C.B.	Irion	2-75	1,248		147
CAL	Irion	6-74	6,997		16,686
CAL, South	Irion	6-75	7,107		51,833
Christi	Irion	8-71	6,824		245,957
Christoval	Tom Green	9-55	5,027		271,266
Christoval (Lower)	Tom Green	7-61	5,156		416,564
Christoval, South	Tom Green	5-54	5,660		321,389
Christoval, S.W.	Tom Green	5-60	6,852		92,313
Dove Creek (-B-)	Irion	2-65	6,354		250,425
Dove Creek (-C-)	Irion	4-65	6,497		102,419
Dove Creek (-D-)	Irion	6-65	6,540		82,602
Dove Creek (Cisco)	Irion	7-65	5,980		18,829
Dove Creek (San Ange)	Irion	6-61	883		64,998
Dove Creek, East	Tom Green	5-66	1,079		69,665
Dove Creek, South	Irion	1-52	7,236		689,940
Dove Creek, S. (6,500)	Irion	8-52	6,450		111,362
Dove Spring	Irion	10-51	6,588		64,629
Dove Spring W.	Irion	9-67	6,529		59,758
Dow-Mayer	Irion	3-72	5,797		165,331
Dusek	Tom Green	12-56	4,010		104,623
Eliza Baker	Tom Green	10-55	6,398		88,673
H-J	Tom Green	3-54	5,502	15,731,187	
Halfman	Tom Green	9-69	4,672		26,828
Hall	Tom Green	11-51	1,295		50,306
Hazel Jones	Tom Green	12-75	5,246		382

TABLE II-D-4 (Cont'd)

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Kenker	Tom Green	8-64	5,408	337,191
Kent	Tom Green	6-61	4,714	825,909
Kingsley	Irion	11-70	6,942	59,494
Knickerbocker (Palo Pinto)	Tom Green	8-67	5,489	32,373
Knickerbocker (R-15)	Tom Green	6-66	6,018	117,646
Knickerbocker (Strawn)	Tom Green	3-64	5,679	379,254
Las Perlas	Irion	4-70	6,397	487,666
Lisa	Tom Green	8-64	4,594	97,962
Lora	Tom Green	1-64	4,665	200,318
Lucky-Mag (Lower)	Irion	9-56	3,390	310,255
Lucky-Mag (3,200)	Irion	4-58	3,090	40,689
Lucky-Mag, W.	Irion	12-64	1,975	49,774
Mertzon (Canyon)	Irion	4-68	6,517	15,028
Mertzon (Lower)	Irion	10-56	2,858	139,202
Mertzon (San Angelo)	Irion	7-55	1,648	2,982,308
Mertzon (Wolfcamp)	Irion	2-64	6,780	66,836
Mertzon W.	Irion	10-60	3,264	41,149
Mim	Irion	9-59	1,402	56,172
Miss Ela	Tom Green	2-75	7,329	35,907
Munn-Green	Tom Green	1-75	6,883	459
Murphey	Irion	10-72	7,835	4,057
Probandt	Tom Green	2-75	7,169	45,295
Sixty-Seven (Canyon)	Irion	11-66	6,684	879,160
Sixty-Seven (Strawn)	Irion	3-56	6,898	1,645,228
Slack	Tom Green	7-70	5,888	46,273
Tankersly (San Angelo)	Irion	7-68	1,184	26,174
Tankersly (5,200)	Irion	7-66	5,216	207,948
Van Keuren	Irion	1-71	2,050	70,076
Wayne-Harris	Irion	7-65	6,696	117,915
Wright-Feathers	Irion	11-59	822	50,000
Wright-Feathers, W.	Irion	9-63	969	16,819

Construction

The only major construction project in Segment 1423 is in Irion County on U.S. 67. The proposal is to improve the alignment and grade on 7.8 miles of highway at an estimated cost of \$1,690,000. The limits of the project as defined in the summary of 1982 projects are from 4.0 miles east of Barnhart to 13.0 miles southwest of Mertzon. This project will extend through a section of soils in the Ector association. The general erodability factor for these soils is 0.10; therefore, due to the location and scope, the probability that this project would cause any sediment problems is very remote.

Waste Disposal

There are four population centers in Segment 1423--Barnhart, Mertzon, and Sherwood in Irion County, and Knickerbocker in Tom Green County. The City of Mertzon operates a treatment and collection system. The other three small communities rely on individual septic tanks for sanitary sewage disposal and individual and limited collective garbage dumps. Area subsurface soils are not extremely adaptable to this type activity; however, due to low population density, system failures do not create a significant impact on area water quality.

Saltwater Intrusion

The subsurface soils and strata in Segment 1423 are not susceptible to intrusion problems because of their relative impermeability. All of this segment is served solely by the Edwards-Trinity Aquifer. The total thickness of this aquifer averages approximately 400 feet.

As in Segment 1422, the only significant source of salt and saltwater in the segment is the enhanced recovery operations of the oil and gas industry. The secondary recovery attempts in the area have been limited to the Mertzon-San Angelo and Mertzon-North oil fields in Irion County. These activities are listed in Table II-D-5.

It does not appear that saltwater intrusion will be a problem in Segment 1423.

Hydrologic Modifications

Twin Buttes Reservoir and dam are in Segment 1423. The hydrologic data for the reservoir is as follows:

Q (M^3/sec) = 2.12; V ($M^3 \times 10^6$) = 219.31; Depth (M) Ave. = 16.8;
Length (M) = 13,062;

TABLE II-D-5

Secondary Recovery Activity in Segment 1423

<u>Field</u>	<u>County</u>	<u>Depth Production Zone (ft.)</u>	<u>Average Horizontal Permeability (Millidarcy)</u>	<u>Beginning Date of Injection</u>	<u>Type of Fluid Injected</u>	<u>Type of Injection</u>
Mertzon (San Angelo)	Irion	1,600	42	7-62	Fresh Water	Waterflood
Mertzon (North)	Irion	1,600	42	1-67	Fresh Water	Waterflood

The densimetric froude number is 1.48×10^{-4} as calculated from the values given above.

This indicates that the reservoir is resistant to disruption by inflows and tends to be oligotrophic. The water quality is good, and should so remain.

Urban Stormwater Runoff

There are no significant urban areas in Segment 1423.

c. Wasteload Projection

Since Segment 1423 is a Category III segment, only point source wasteloads need to be projected at this time. However, there are no existing point source dischargers located in the segment and none are projected for the next twenty years. Therefore, no point source wasteloads are projected to impact the segment through the planning period.

d. Wasteload Analysis

Twin Buttes Reservoir is classified as "Effluent Limiting" and its waters are deemed desirable for contact and non-contact recreation, propagation of fish and wildlife, and domestic raw water supply. To accommodate these needs, the following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	150 mg/l
Sulfate (not more than)	150 mg/l
Total Dissolved Solids (not more than)	700 mg/l

There are no existing point sources discharging wastes into the segment. Ranching accounts for most of the nonpoint source activities in the drainage area of the segment. Other nonpoint source activities including mining and septic tank operations. Available information, as presented in the Water Quality Assessment Chapter of the Basic Data Report, indicates these nonpoint source activities have not created any water quality problems to date with the waters of this segment. The segment is free of any violations of established water quality standards.

No point source wasteloads are projected to be discharged into the segment by the year 2000. Since the existing nonpoint source discharges do not create water quality problems

in the segment, nor is any significant change in nonpoint source activity anticipated, water quality in the segment is expected to remain good through the planning period.

e. Sewerage Planning Area Alternative Plans

Since there are no sewerage planning areas in Segment 1423, no alternative plans have been developed.

4. SEGMENT 1424

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Middle Colorado Basin Segment 1424. Additional detailed information is provided in Appendix E, Legal Authority of Agencies in the San Angelo Area.

This section contains three major topics: description of boundaries, identification of major management agencies and the definition of water quality control programs in Segment 1424.

(2) Physical Boundaries. Segment 1424 contains the two drainage areas of South and Middle Concho rivers above Twin Buttes Reservoir. The two areas are not contiguous, but are separated by Segment 1423 (Spring Creek and Dove Creek).

(3) Existing Management Agencies. The primary federal and state agencies involved in segment management functions are the EPA and the TDWR. The Concho Valley Council of Governments has general planning and clearinghouse responsibilities within the segment. County governments with certain management responsibilities are Tom Green, Schleicher, Sterling, Irion, Crockett, Glasscock, Reagan, and Upton. Intergovernmental devices allow for contracting for wastewater management functions between or among agencies within or outside the segment boundaries.

Two incorporated cities, Big Lake and Eldorado, along with several special districts, lie within the segment boundaries. There are three waste control orders in existence.

(4) Water Quality Control Programs. There are three basic groups of program management functions which consist of general management and regulation, treatment works management, and nonpoint control. The functions within each group are discussed in Chapter C of this report under Institutional and Legal requirements. The TDWR has the major role in performing general management and regulation functions with participation of the EPA, regional agencies, and local governments. There are no 201 facility planning projects or 208 sewerage planning areas in the segment. General planning is conducted within the segment by the Concho Valley COG. Water quality is monitored through the networks of the TDWR and USGS. The cities of Big Lake and Eldorado manage existing treatment works. Local governments (county or city) carry out nonpoint source control programs.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 1424. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information are provided in Appendix F, Nonpoint Source Assessment Methodology.

(2) Assessment. There are seven categories of nonpoint source activities identified in Segment 1424. A discussion of each category and its related water quality problems is given below.

Agricultural

General soils maps show a strong predominance of the Tarrant-Ector, Ector, and Reagan associations. The Ector soils are not conducive to cultivation but provide adequate forage for livestock. Reagan soils are level, silty clay loams which are well suited for irrigation farming; however, most of this area is devoted to ranching activities.

Mining

As in the other segments, the oil and gas industry is the only significant mining activity. The listing of oil and gas fields for Segment 1424 is given in Table II-D-6.

TABLE II-D-6

Oil and Gas Production Fields in Segment 1424
Oil and Gas Division
Railroad Commission of Texas

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Arden	Irion	9-53	6,232	45,273
Arden S. (Canyon)	Irion	9-65	6,386	381,415
Arden S. (Lower)	Irion	9-67	6,553	60,528
Arden S.E.	Irion	8-74	6,332	8,378
Atkinson N.E. (San Angelo)	Tom Green	10-60	392	31,197
Atkinson N.E. (Strawn)	Tom Green	7-59	5,590	161,725
Atkinson W.	Tom Green	3-65	816	510,582
Barbee	Reagan	8-58	6,756	498,329

TABLE II-D-6 (Cont'd)

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Barnhart	Reagan	8-41	9,008	15,711,402
Barnhart (Grayburg)	Reagan	10-75	2,577	2,546
Barnhart, S.	Reagan	6-52	9,060	560,786
Benedum	Upton	12-47	7,593	20,443,348
Big Lake	Reagan	1923	3,000	123,470,185
Big Lake (Dean)	Reagan	8-56	6,904	39,723
Big Lake (1-11)	Reagan	10-53	8,890	130,015
Big Lake (Sprayberry)	Reagan	3-64	6,206	340,412
Big Lake, N.	Reagan	3-65	9,238	85,476
Big Lake, W.	Reagan	2-53	9,240	422,061
Big Salute	Sterling	8-74	7,739	26,276
Block	Reagan	11-55	2,456	740,370
Buckhorn, N.	Schleicher	1-70	6,984	9,702
Cope	Reagan	5-51	6,031	10,937,804
Crandell	Sterling	4-53	1,479	13,375
Credo (Wolfcamp)	Sterling	4-63	7,334	3,123,469
Credo (Lower)	Sterling	8-62	7,430	2,283,608
Credo (Upper)	Sterling	12-65	7,278	79,370
Credo E.	Sterling	8-69	7,064	539,141
Credo N. (Cisco)	Sterling	2-75	7,974	807
Credo N. (Wolfcamp)	Sterling	8-68	7,330	13,212
Eldorado	Schleicher	12-48	4,072	226,067
Flat Rock (San Angelo)	Upton	4-74	7,035	5,125
Flat Rock (Sprayberry)	Upton	7-51	7,245	1,388,249
Funk	Tom Green	2-52	739	193,726
Grayson	Reagan	1928	3,185	1,150,570
Hulldale	Schleicher	10-50	5,772	24,283,593
John-Scott	Reagan	11-53	2,534	2,110,958
Ketchum Mt.	Irion	7-55	4,548	2,099,064
Madora	Tom Green	6-63	4,487	40,983
Madora E. (Upper)	Tom Green	7-67	4,719	16,468
Madora E. (4,600)	Tom Green	1-64	4,600	15,542
McIntyre	Irion	12-56	4,510	10,116
Nathan Miller	Irion	11-64	3,824	245,522
Neva, W. (Canyon)	Schleicher	1-52	6,122	494,879
Neva, W. (Strawn)	Schleicher	8-51	6,217	12,113,526
Pettersen	Irion	10-55	1,875	47,851
Price	Reagan	8-53	2,410	1,718,463
Priscilla	Reagan	11-64	2,450	82,753

TABLE II-D-6 (Cont'd)

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Santa Rita	Reagan	7-61	3,134	93,900
Seven D (5,530)	Reagan	8-66	5,544	24,180
Seven D (Wolfcamp)	Reagan	9-51	7,570	99,863
Sprayberry	Reagan	5-55	6,194	8,541,820
Stiles (Clear Fork)	Reagan	9-63	4,470	184,144
Stiles (Fusselman)	Reagan	7-57	10,294	381,454
Sugg	Irion	1955	4,518	288,922
Sugg, N.	Irion	6-56	4,349	289,967
Sugg, Irion	Irion	4-74	5,723	25,213
Texon S.	Reagan	5-68	3,266	410,706
Texon W.	Reagan	12-64	6,923	2,321,848
Tillery	Schleicher	6-53	3,568	1,659,480
Tillery N.W.	Schleicher	1-68	4,104	10,752
Toenail (Harkey)	Schleicher	9-60	5,580	171,752
Toenail (Strawn)	Schleicher	3-53	5,250	3,759,910
V-Bar	Reagan	6-55	2,294	95,210
Wardlaw Three	Irion	7-74	6,630	9,460

Construction

The only significant construction project in Segment 1424 is in Tom Green County on U.S. 277. Extending from 5.5 miles north of Christoval to 1.3 miles south of Christoval for a length of 7.1 miles, this bypass project is projected for a 1982 letting at an estimated cost of \$2,830,000. The project is significant in that it is very close to the South Concho River, and could contribute sediment to that water body. The area soils are of the Rio Concho-Spur association which are in soil class C and B respectively with a general erodability factor of approximately 0.3. All this amounts to the fact that this project could contribute to degradation of water quality if improperly planned or if erosion control practices are not implemented.

Waste Disposal

There are five population centers in Segment 1424--Big Lake, Eldorado, Christoval, Texon, and Best. Christoval, Texon, and Best are very small communities which do not provide any sewage services. Individual septic tanks are utilized exclusively, with individual and common dumping spots utilized for solid residential garbage.

Eldorado has a sewage treatment facility that was constructed in 1946 with a design capacity of 0.072 mgd. This plant presently serves approximately 1,200 people. The present plant, when properly maintained, is functioning properly; however, improvements should be made by 1985 to maintain the current efficiency. Area water quality has not exhibited any indicators that this particular source is contributing to degradation. Solid residential waste is dumped in a community landfill site.

Big Lake has a sewage treatment plant that was built in 1954 with a design capacity of 0.375 mgd. This plant is currently serving approximately 2,500 people. The plant is well maintained and load projections indicate no foreseeable overload problems. The treated effluent is routed to areas around Big Lake which allow for evaporation and percolation. Solid residential wastes are handled in a community sanitary landfill site.

Saltwater Intrusion

The subsurface soil strata in Segment 1424 are largely impermeable and not susceptible to intrusion-type pollution problems. The oil and gas industry has utilized some brine and saltwater fluids in secondary and enhanced recovery processes in oil and gas fields in Segment 1424. The location and extent of these activities are listed in Table II-D-7.

Hydrologic Modifications

There are no significant hydrologic modifications in Segment 1424.

Urban Stormwater Runoff

Although two moderate-sized urbanized areas exist in Segment 1424 (Big Lake and Eldorado), neither discharges into a stream segment which is suffering any water quality problems. The impermeable surface percentage is low because each community is of a rural nature with a small amount of paving. This contributes to small sediment yield, and resultant good water quality.

c. Wasteload Projections

Since Segment 1424 is a Category II segment, only point source wasteloads need to be projected. There are three WCO holders located in the segment. None of these point sources is discharging or is projected to discharge into the segment within the planning period. Therefore, no point source wasteloads are projected to impact the segment within the next twenty years.

TABLE II-D-7

Secondary and Enhanced Recovery in Segment 1424
 Oil and Gas Division
 Railroad Commission of Texas

<u>Field</u>	<u>County</u>	<u>Depth Production Zone (Feet)</u>	<u>Average Horizontal Permeability (Millidarcy)</u>	<u>Beginning Date of Injection</u>	<u>Type of Fluid Injected</u>	<u>Type of Injection</u>
Atkinson, W.	Tom Green	816	287	10-69	Salt Water	Press Maint.
Benedum	Upton	6,600	1	3-68	Salt Water	Waterflood
Cope	Sterling	5,100	25	8-59	Salt Water	Waterflood
Hulldale	Schleicher	5,600	43	10-67	Salt Water	Waterflood
John Scott (Univ.)	Reagan	2,669	3	9-73	Salt Water	Waterflood
John Scott (Wolters)	Reagan	2,750	3	11-68	Brine Water	Waterflood
John Scott (Grayburg)	Reagan	2,734	2	11-73	Brine Water	Waterflood
Tillery	Schleicher	3,560	50	10-60	Salt Water	Waterflood
Toenail	Schleicher	5,250	15	6-64	Gas	Press Maint.

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d. Wasteload Analysis

South and Middle Concho rivers above Twin Buttes Reservoir have been classified as "Effluent Limiting." The desirable water uses designated for this segment are contact and non-contact recreation, propagation of fish and wildlife, and domestic raw water supply. To accommodate these needs, the following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	150 mg/l
Sulfate (not more than)	150 mg/l
Total Dissolved Solids (not more than)	700 mg/l

Segment 1424 does not receive any point source wasteloads at the present time. Ranching is the most significant non-point source activity within the drainage area of the segment. Other nonpoint sources which may contribute wasteload to the segment include highway construction, mining, septic tanks, and urban stormwater runoff. These nonpoint source activities have not caused any water quality problem to date in the segment. Measured water quality in the segment is quite good and free of any violations of established water quality standards.

Since no point sources are projected to discharge into the segment and no significant change in nonpoint source activities is anticipated within the planning period, serious water quality problems are not expected in Segment 1424 for the next twenty years.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas identified in Segment 1424; thus, no alternative plans are developed.

5. SEGMENT 1425

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Middle Colorado Basin Segment 1425. Additional detailed information is provided in Appendix E, Legal Authority of Agencies in the San Angelo Area.

This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 1425.

(2) Physical Boundaries. Segment 1425 contains the drainage area of North Concho River and O.C. Fisher Reservoir.

(3) Existing Management Agencies. The primary federal and state agencies involved in segment management functions are the EPA and the TDWR. The Concho Valley Council of Governments and Permian Basin Regional Planning Commission have general planning and clearinghouse responsibilities within the segment. County governments with certain management responsibilities are Tom Green, Irion, Coke, Sterling, Reagan, Glasscock, and Howard. Intergovernmental devices allow for contracting for wastewater management functions between or among agencies within or outside the segment boundaries.

Three cities of Sterling City, Garden City, and Forsan, along with several special districts, lie within the segment boundaries. There is one waste control order in existence.

(4) Water Quality Control Programs. There are three basic groups of program management functions which consist of general management and regulation, treatment works management, and nonpoint control. The functions within each group are discussed in Chapter C of this report under Institutional and Legal requirements. The TDWR has the major role in performing general management and regulation functions with participation of the EPA regional agencies and local governments. There is one 201 facility planning project within the segment for Sterling City (No. 1268). There are no 208 sewerage planning areas in the segment. General planning is conducted within the segment by the Concho Valley COG. Water quality is monitored through the networks of the TDWR and USGS. There are no cities which manage existing treatment works. Local governments (county or city) carry out nonpoint source control programs.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 1425. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix F, Nonpoint Source Assessment Methodology.

(2) Assessment. There are seven categories of nonpoint source activities identified in Segment 1425. A discussion of each category and its related water quality problems is given below.

Agricultural

Approximately 88 percent of the land in Segment 1425 is used for ranching. About another 9 percent is used in dryland farming with about 1 percent used as irrigated cropland. The dominant soil groups in Segment 1425 are of the Tarrant and Ector associations with some secondary exposures of the Kimbrough, Mereta, Angelo, and Rio Concho associations. These latter groups tolerate cultivation more so than the Tarrant and Ector associations; however, the ranching usage has been maintained due to historical and climatological conditions.

Mining

The only significant mining activities are those of the oil and gas industry. The production fields in Segment 1425 are listed in Table II-D-8.

TABLE II-D-8

Oil and Gas Production Fields in Segment 1425
Oil and Gas Division
Railroad Commission of Texas

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Albaugh-Cole	Sterling	4-69	6,970	98,297
Bailey	Sterling	10-75	7,743	766
Clark (Glorietta)	Sterling	2-59	1,305	158,686
Clark (San Andres)	Sterling	7-49	890	823,095
Conger (Canyon)	Sterling	5-75	7,974	5,643
Conger (Cisco)	Sterling	6-74	6,973	56,359

TABLE II-D-8 (Cont'd)

<u>Field Name</u>	<u>County</u>	<u>Discovery Date</u>	<u>Depth Feet</u>	<u>Cumulative Production (Barrels) a/o 1-76</u>
Deck	Sterling	9-72	7,984	13,328
Durham	Sterling	4-50	1,404	358,232
Durham (York)	Sterling	9-65	1,694	119,246
Garden City	Glasscock	9-46	9,740	538,268
Garden City (Strawn)	Glasscock	12-65	9,349	80,028
Garden City S.E.	Glasscock	8-66	9,337	44,996
Garden City, W.	Glasscock	10-59	6,550	47,916
Garden City, W. (7,880)	Glasscock	8-66	7,920	967,295
Herrell	Sterling	8-50	2,425	419,697
Herrell (Grayburg)	Sterling	9-62	1,691	186,613
Herrell, E.	Sterling	12-53	1,454	1,993,732
Kennemer	Tom Green	2-65	5,735	23,263
Lacy Creek	Sterling	5-67	2,237	69,135
McEntire (Fusselman)	Sterling	12-67	8,590	329,769
McEntire (Wolfcamp)	Sterling	6-75	6,764	2,740
Parochial-Bade (Cisco)	Sterling	7-75	7,704	321
Parochial-Bade (Ced Fk)	Sterling	4-54	2,211	2,501,751
Parochial-Bade (Fussel)	Sterling	10-66	8,788	14,283
Parochial-Bade (Qn.Snd)	Sterling	4-51	1,103	922,295
Parochial-Bade (Lower)	Sterling	4-54	1,336	350,338
Parochial-Bade E.	Sterling	7-63	2,081	151,851
Parochial-Bade W. (Qn)	Sterling	4-65	1,321	223,050
Parochial-Bade W. (7-Rvs)	Sterling	9-65	1,136	55,258
Sterling	Sterling	10-66	8,662	61,589
Triple C. (Canyon)	Sterling	4-75	6,827	1,452
Triple C. (Ellenburger)	Sterling	6-73	8,100	98,389
Triple M. (Wolfcamp)	Sterling	1-63	6,694	190,212
Triple M. (Lower)	Sterling	6-63	6,888	562,556
Triple M. (Upper)	Sterling	7-63	6,746	2,719,159
W.A.M. (Fusselman)	Sterling	5-65	8,433	20,165
W.A.M. (Montoya)	Sterling	1-70	8,517	25,135
W.A.M. S.	Sterling	3-65	8,677	1,648,454
Water Valley (Cl Fk)	Tom Green	3-57	1,370	401,147
Water Valley (San Andres)	Tom Green	12-48	1,035	2,845,272

Construction

There are no ongoing or proposed construction projects in Segment 1425, according to the 10-year advance program listing provided by the State Department of Highways and Public Transportation.

Waste Disposal

There are five population centers in Segment 1425--Sterling City, Garden City, Forsan, Water Valley, and Carlsbad. All of these centers are very small communities that currently rely on individual septic tanks and landfill areas for domestic wastes.

Sterling City, however, has plans in the offing to construct a collection and treatment system. Carlsbad has a nearby treatment facility; however, at present it serves only the San Angelo Center (Texas Department of MH/MR). The plant was constructed in 1925 with a design capacity of 0.25 mgd, and presently serves at an estimated loading of 0.08 mgd under a no-discharge permit. The unit was completely overhauled in 1970 and is maintained in good condition. There is no reason to anticipate any pollutant outflows from this facility.

Saltwater Intrusion

The only significant sources of saline pollutants in Segment 1425 are the injection fluids utilized in the secondary recovery processes of the oil and gas industry. The production fields where these processes are employed are listed in Table II-D-9.

Hydrologic Modifications

The only significant hydrologic modification in Segment 1425 is O.C. Fisher Reservoir. The hydrologic data for that impoundment is as follows:

$$Q \text{ (M}^3\text{/sec)} = 0.28; V \text{ (M}^3 \times 10^6\text{)} = 147.03; \text{Depth (Ave) (M)} = 21.9;$$

$$\text{Length (M)} = 9,254;$$

The densimetric froude number is 2.6×10^{-4} as calculated from the values given above.

This indicates that the reservoir is resistant to disruption by inflows and tends to be oligotrophic. The water quality is good and should so remain.

TABLE II-D-9

Secondary and Enhanced Recovery in Segment 1425
 Oil and Gas Division
 Railroad Commission of Texas

<u>Field</u>	<u>County</u>	<u>Depth Production Zone (Feet)</u>	<u>Average Horizontal Permeability (Millidarcy)</u>	<u>Beginning Date of Injection</u>	<u>Type of Fluid Injected</u>	<u>Type of Injection</u>
Calvin	Reagan	7,000	1	11-67	Salt Water	Waterflood
Sprayberry (Trend) South Stiles	Reagan	5,900	1	12-72	Salt Water	Waterflood
Sprayberry (Trend) Merchant	Reagan	6,785	1	8-65	Salt Water	Press. Maint.
Sprayberry (Trend) Pembrook	Reagan	7,000	2	9-64	Salt Water	Waterflood
Sprayberry (Trend) North Pembrook	Reagan	7,000	1	11-62	Salt Water	Waterflood
Sprayberry (Trend) Childress	Reagan	5,600	14	6-71	Salt Water	Waterflood
Parochial-Bade	Sterling	2,250	99	7-64	Salt Water	Waterflood

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Urban Stormwater Runoff

The small rural communities in this segment have a very small percentage impervious area, and do not have the potential to significantly degrade water quality during a critical storm event.

c. Wasteload Projection

Segment 1425 is a Category III segment; only point source wasteloads need to be projected. However, since only one WCO holder is located within the segment and it operates on a no-discharge basis, the point source load projected for the planning period is zero.

d. Wasteload Analysis

O. C. Fisher Reservoir has been classified as an "Effluent Limiting" segment. The desirable water uses designated for this segment are contact and noncontact recreation, propagation of fish and wildlife, and domestic raw water supply. To accommodate these needs, the following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	150 mg/l
Sulfate (not more than)	150 mg/l
Total Dissolved Solids (not more than)	700 mg/l

An examination of the Water Quality Assessment Chapter of the Basic Data Report indicates existing water quality is very good in the segment and free of any water quality standard violations. Since no point source discharges into the segment, the water quality can be affected only by pollution of nonpoint source origin. Since no significant change in point source and nonpoint source activity is anticipated, the excellent water quality conditions can be expected to continue for the duration of the planning period.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas located in this segment; thus, no alternative plans are developed.